

SHADOW CLIFFS REGIONAL RECREATION AREA



East Bay Regional Park District



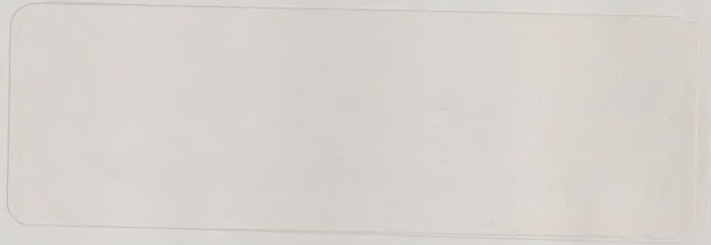
RESOURCE ANALYSIS



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SHADOW CLIFFS REGIONAL RECREATION AREA
RESOURCE ANALYSIS



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Introduction

Chapter 1

INTRODUCTION

Overview

This Resource Analysis is the first of two planning documents which will be used by the East Bay Regional Park District (EBRPD or the District) in formulating a long-term management plan for Shadow Cliffs Regional Recreation Area (Shadow Cliffs). The Resource Analysis provides an inventory of natural, cultural, and man-made resources present at Shadow Cliffs. The subsequent report, the Land Use Plan/Environmental Impact Report, will use this data base.

Description and Location

Shadow Cliffs is a 249-acre recreation area featuring a 90-acre lake located between the cities of Livermore and Pleasanton, Alameda County, California (Figure 1-1) and operated by the EBRPD. Shadow Cliffs offers both land- and water-related recreational opportunities. Land-related recreation includes hiking, picnicking, bicycling, birdwatching, and kite flying. Water-related recreation stems from Shadow Cliffs lake, the 0.25-acre Heron Pond, the 2-acre Remillard Pit marsh, the intermittent north west trending Arroyo Del Valle, and the Shadow Cliffs Waterslide. Water-related recreation includes fishing, swimming, boating, birdwatching, nature study, and the water slide.

Shadow Cliffs is a former sand and gravel quarry site dedicated to the EBRPD by Kaiser Industries. Matching funds from the U. S. Bureau of Outdoor Recreation (presently the National Park Service) enabled EBRPD to develop and open Shadow Cliffs as a 144-acre park in 1971. Further development and expansion of the park's boundary has continued over the years. The water slide began operation in 1981.

Although the area has been greatly disturbed by quarrying, plant community types represented at the park now include: cottonwood and willow riparian; cattail marsh, river aquatic, lake aquatic, coyote brush, and grassland. Wildlife occurring in the area includes: gray fox, raccoons, brush rabbit, and other small mammals. Bird use of the park is particularly diverse. Many avian species, including several raptors and migrant waterfowl, use the park.

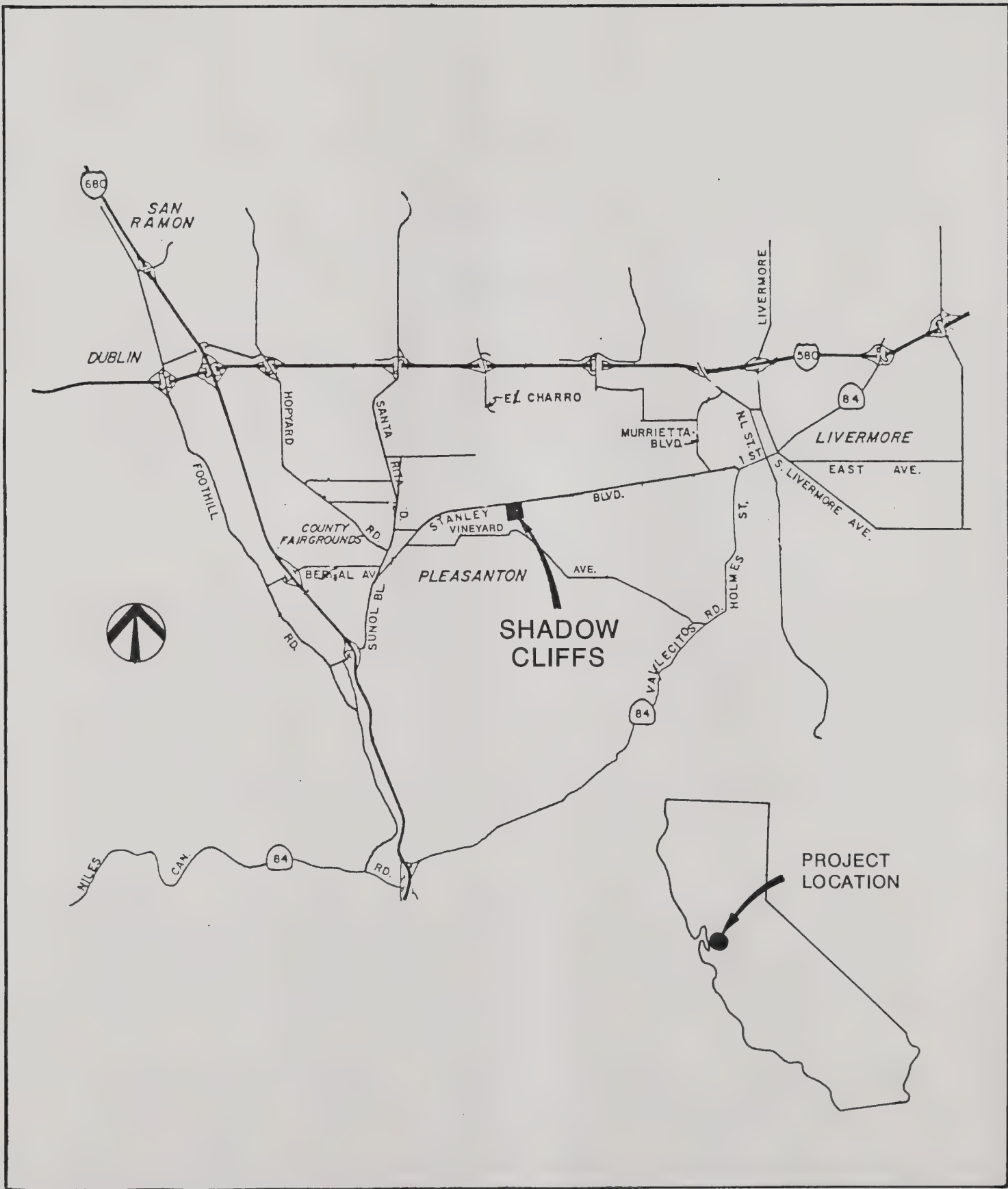


FIGURE 1-1. LOCATION MAP

Source: Modified From East Bay Regional Park District 1980a

The predominant land uses surrounding the park to the north and east are active sand and gravel quarries. Residential development is occurring to the south and west. Residents of the Livermore-Amador Valley (i.e., northeastern Alameda County and southern Contra Costa County) are the principal users of Shadow Cliffs (Harrison, 1985).

The entrance to Shadow Cliffs is on Stanley Boulevard, approximately 2 miles east of its junction with Santa Rita Road. The park is accessible from U. S. Interstate 580 via Santa Rita Road and Hopyard Road in Pleasanton. It is also accessible from U. S. Interstate 680 via Bernal Avenue and Sunol Boulevard in Pleasanton (Figure 1-1).

EBRPD Planning Process

Purpose and Role of the District

The EBRPD is a state authorized special district established for the purposes of acquiring, developing, and operating parklands for public use in perpetuity to serve residents of Alameda and Contra Costa Counties. The District is authorized to acquire and operate parklands to make the outdoor environment available for the enjoyment and education of the general public (East Bay Regional Park District, 1980c).

The EBRPD's goal is to become a major participant in improving the quality of life for residents of Alameda and Contra Costa counties. To fulfill this goal, the District's adopted objectives are to:

1. provide a diversified land and water system of regional parks, recreation areas, wilderness, preserves, trails and shorelines, and parkland-related services which will provide District residents with opportunities for creative use of outdoor leisure time;
2. acquire, preserve, and interpret significant examples of the natural environment, including biologic, geologic, scenic, and outdoor historic resources which exist within the boundaries of the District;
3. cooperate with other public agencies in the acquisition, preservation, and management of nonpark open space lands;
4. emphasize balance of both environmental concerns and regional recreation opportunities within the system of parklands operated by the District; and
5. effectively conserve energy by dispersed location of parklands close to the people throughout the District by

reasoned management of energy resources available to the District; and by cooperating with other public and private entities in joint efforts to conserve diminishing energy resources.

(East Bay Regional Park District, 1980c.)

Purpose of this Resource Analysis

The Shadow Cliffs Resource Analysis is a part of the planning process required by the District's major policy document, the EBRPD Master Plan (adopted 1973, revised 1980). The purpose of the Resource Analysis is to identify and discuss the natural and cultural resources and relevant management issues of the park. The Resource Analysis is intended to serve as a background document to aid in the ultimate formulation of a proposed Land Use Plan and Environmental Impact Report.

The District's Master Plan (1980c) Parkland Planning Policy 9b provides, in part:

After a parkland site has been acquired by the District and prior to the development of a land use plan, the District will complete a resource analysis which will identify features of the parkland which have significant resource value...

This Resource Analysis has been prepared pursuant to Policy 9b.

Regional Recreation Area Classification and Purpose

Shadow Cliffs is a designated Regional Recreation Area. The purpose of a Regional Recreation Area, one of seven EBRPD Master Plan classifications, is "to provide a variety of outdoor recreation experiences on a site particularly suited to recreational activities of a regional significance." (East Bay Regional Park District, 1980c.)

The District's Master Plan (1980) provides the following minimum standards and planning and management guidelines applicable to Regional Recreation Areas:

Minimum Standards

Regional Recreation Areas shall:

- o have approximately 100 or more suitable acres of land or land and water;

- o be capable of development for recreational uses compatible with any significant environmental features contained within or adjacent to the Recreation Area;
- o be capable of withstanding intensive public use (applies to both land and facilities); and
- o have proven recreational resources which can include man-made or natural bodies of water for providing multiple recreational opportunities such as swimming, family and group picnics, fishing, boating, etc.

Planning and Management Guidelines

- o The area should be planned and developed to accommodate a variety of compatible recreation forms. Alteration of the environment and extensive maintenance may be necessary to facilitate relatively intensive public use of the area.
- o Wherever feasible, outdoor educational facilities and programs should be provided within a Regional Recreation Area. Marshes, wildlife habitat areas, ponds, and other similar resources may be created for this purpose.
- o In order to provide facilities for a wide range of park users, development may include improvements such as swimming beaches, small boat marinas, bathhouses, man-made lakes, playing fields, and other facilities for recreational activities of regional significance.

Adopted Planning Reports

Shadow Cliffs Reports. The District has published an Environmental Impact Report (EIR) for the development of the waterslide in 1981 (East Bay Regional Park District, 1980a,b). The District has also adopted district-wide plans and manuals for managing park resources (East Bay Regional Park District, 1978, 1979, and 1980c).

Planning Area Reports. The Alameda County Planning Department is currently revising the various elements of its General Plan for the Livermore-Amador Valley Planning unit (Alameda County Planning Department, 1986). The City of Pleasanton has recently revised its General Plan (1987). The Alameda County Board of Supervisors has adopted a Specific Plan for quarry operations surrounding Shadow Cliffs (Alameda County Board of Supervisors, 1981). The Specific Plan incorporates a Draft EIR which more fully describes the chain-of-lakes plan and its impacts (Alameda County Planning Department, 1979).

Four studies are relevant to understanding the area's water resources. Three have been adopted by the relevant agency (Brown and Caldwell, 1972, Department of Water Resources, 1974

and 1986). The fourth (U. S. Geological Survey, 1985) is investigatory only.

Recreation Area Names

This section describes the names of the various features within the Shadow Cliffs Regional Recreation Area. The locations of these features appear in Figure 1-2.

Shadow Cliffs. Both the lake and the regional recreation area share this name. The name stems from the interesting visual phenomena which occur along the cliffs as the sun sets. In the evenings, shadows are created by the northern and eastern cliffs resulting from past mining activities. The lake was sometimes designated "Shadow Lake" in earlier reports. For consistency, the name "Shadow Cliffs Lake" is preferred.

Arroyo Del Valle. This was the Spanish name for the stream which runs through much of the Livermore-Amador Valley. Translated, it means the valley stream.

The Arroyo Del Valle levee is the name used for the earthen levee which separates the Arroyo Del Valle from the remainder of the park.

Heron Pond. Heron Pond is named for its occasional use by individual Great Blue Heron.

Remillard Marsh. This area was named for the historical landowner of this portion of the recreation area. The Remillard Brick Company owned the western portion of what is now Shadow Cliffs Regional Recreation Area (see Chapter 3, "Cultural Resources Inventory").

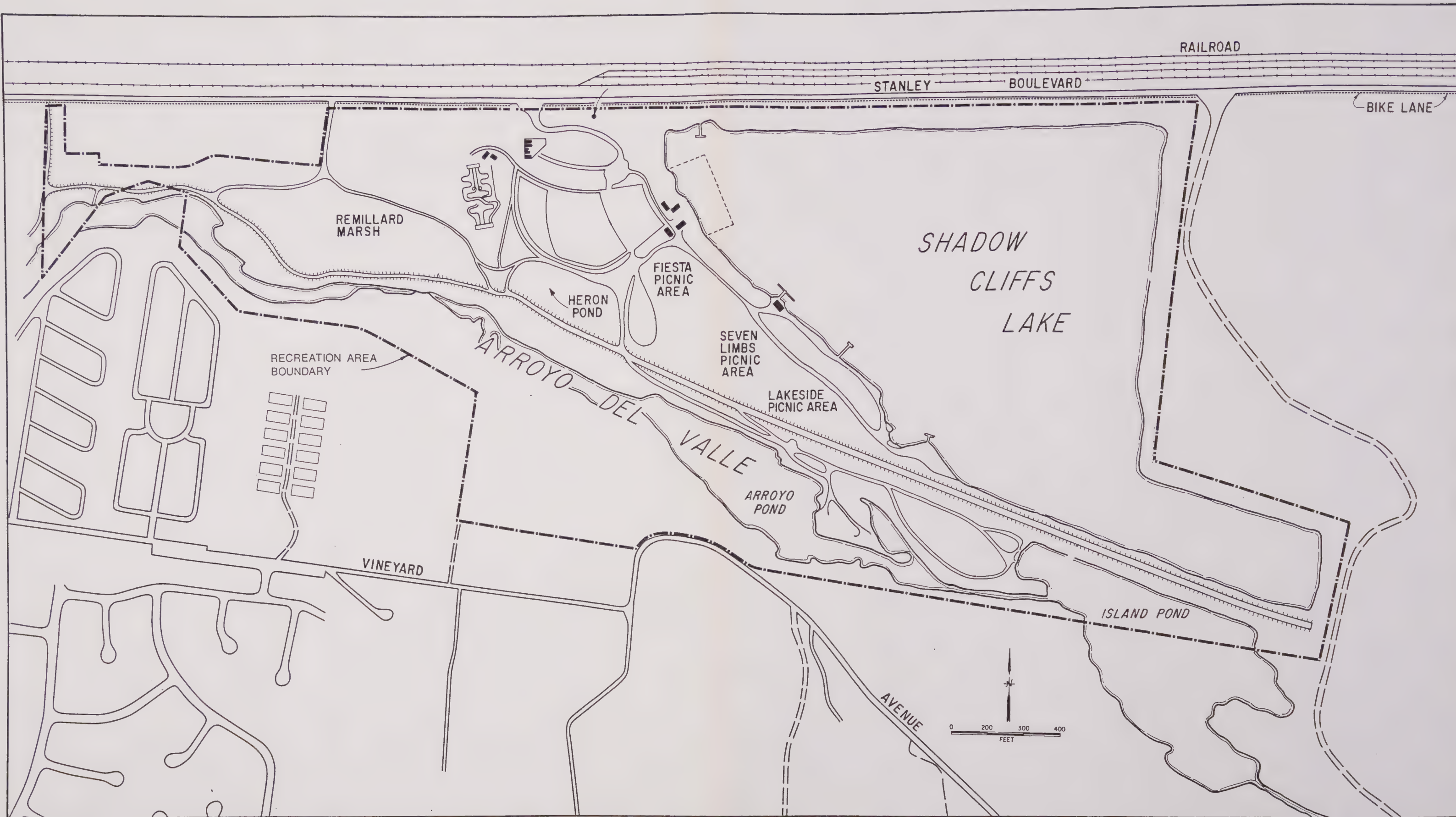
Seven Limbs Picnic Area. This area was named for a distinctive tree which occurred onsite.

Fiesta Picnic Area. This is the name of the northernmost picnic area.

Lakeside Picnic Area. This is the name of the picnic area closest to Shadow Cliffs Lake.

Island Pond. This is the name of the Arroyo Del Valle pond area which contains an island.

Arroyo Pond. This is the other pond in the Arroyo Del Valle.



RECREATION AREA NAMES

FIGURE 1-2

Natural Resources Inventory

Chapter 2

NATURAL RESOURCES INVENTORY

Topography and Visual Resources

Topography

The Shadow Cliffs Regional Recreational Area is located on the Livermore-Amador Valley floor with elevations ranging from 275 feet at the lowest portion of the lake bottom to 400 feet at the top of the slope which forms the southern boundary of the park. The park is a topographic low portion of the valley. Park topography is characterized by severe surface disturbance resulting from past gravel quarry operations and subsequent instability and erosion. Other major features include Shadow Cliffs Lake and the Arroyo Del Valle ravine. Figure 2-1 illustrates the topography in the area.

The park can be divided into two landform units: one north of the levee, the other to the south. The top of the levee is approximately equal to the original ground level before mining operations began. The parking and picnic areas are approximately 30-40 feet below the levee.

The northern land form unit is relatively flat with a gentle slope (i.e., <5 percent) to the east. Topographic contrast is provided by the banks which border the park to the north and east. These are steep slopes, 1.5:1, the tops of which are approximately 50 feet above the rest of the unit. Topographic relief in the western end of the unit is provided by the waterslide hill, which is elevated approximately 40 feet, and various berms which have been placed to shield views of the parking lot from other areas of the park.

The lake has a mean surface level elevation of approximately 330 feet. Figure 2-1 illustrates the bottom topography of the lake. The northern and eastern banks are extensions of the previously mentioned steep park borders. The western shore slopes gently into the lake.

The southern land form unit contains the Arroyo Del Valle. The surface here is also disturbed by past quarry operations. The southern boundary of the park includes the slope up from the valley floor. The highest elevations in the park occur here (>400 feet).

Visual Resources

Views in the general vicinity of Shadow Cliffs reflect one of three types: gentle rolling hills supporting grazing or other agriculture; urbanized residential development; or severely disturbed areas associated with gravel mining operations. The visual resources of Shadow Cliffs itself can be analyzed in terms of onsite views (those views perceived by persons at the park) and offsite views (those views of the park perceived by persons outside the park). Analysis of visual resources is subjective and dependent upon each individual's particular response to an aesthetic stimulus (Environmental Protection Agency, 1973). Photographs are provided in this section with a map indicating the general areas from which the photographs were taken (Figure 2-2).

The park itself is not visible from most offsite vantages due to its low elevation. From Stanley Boulevard, the major adjacent transportation corridor, the park is visible from the bicycle path and the southernmost edge of the road only. Views within the park are substantially constrained by the topography of the park. The elevated levee which separates the Arroyo Del Valle from the remainder of the park shields views of the park from those within the Arroyo area and vice versa. Views of the surrounding area from within the park include the quarry facilities and residential development.

Onsite Views. For purposes of this resource analysis, onsite views include foreground views, those areas closest to the viewer (essentially the area within the park), and background views, those areas farther away from the viewer (essentially the area outside the park). This analysis has divided the park into four visual units: the lake; the picnic area; the water slide area; and the Arroyo Del Valle natural area.

Shadow Cliffs Lake. Shadow Cliffs lake is the predominant visual feature of the park north of the elevated levee. Both offshore and onshore views of the lake are visible. Offshore views of the lake are available to boaters from any vantage. Onshore views of the lake from the north bank are limited to the northwest of the lake where a fishing dock is located. Access to the east end of the north bank is restricted. Figure 2-3 is a typical offshore view looking from the north side of the lake to the south bank. Foreground views include the lake, waterfowl, recreation facilities, and the north bank of the Arroyo Del Valle levee. Background views include transmission lines and residential development along the hilltops.

Onshore views of the lake from the eastern bank are limited since access to the eastern bank itself is restricted and the area atop the eastern levees is controlled by the adjoining land owner (Lone Star Industries). Figure 2-4 presents a panorama from atop the Arroyo Del Valle levee at the northeasternmost corner of the lake. Foreground views include the north bank,



TOPOGRAPHY

Source: Modified from U.S. Geological Survey 1980

FIGURE 2-1.

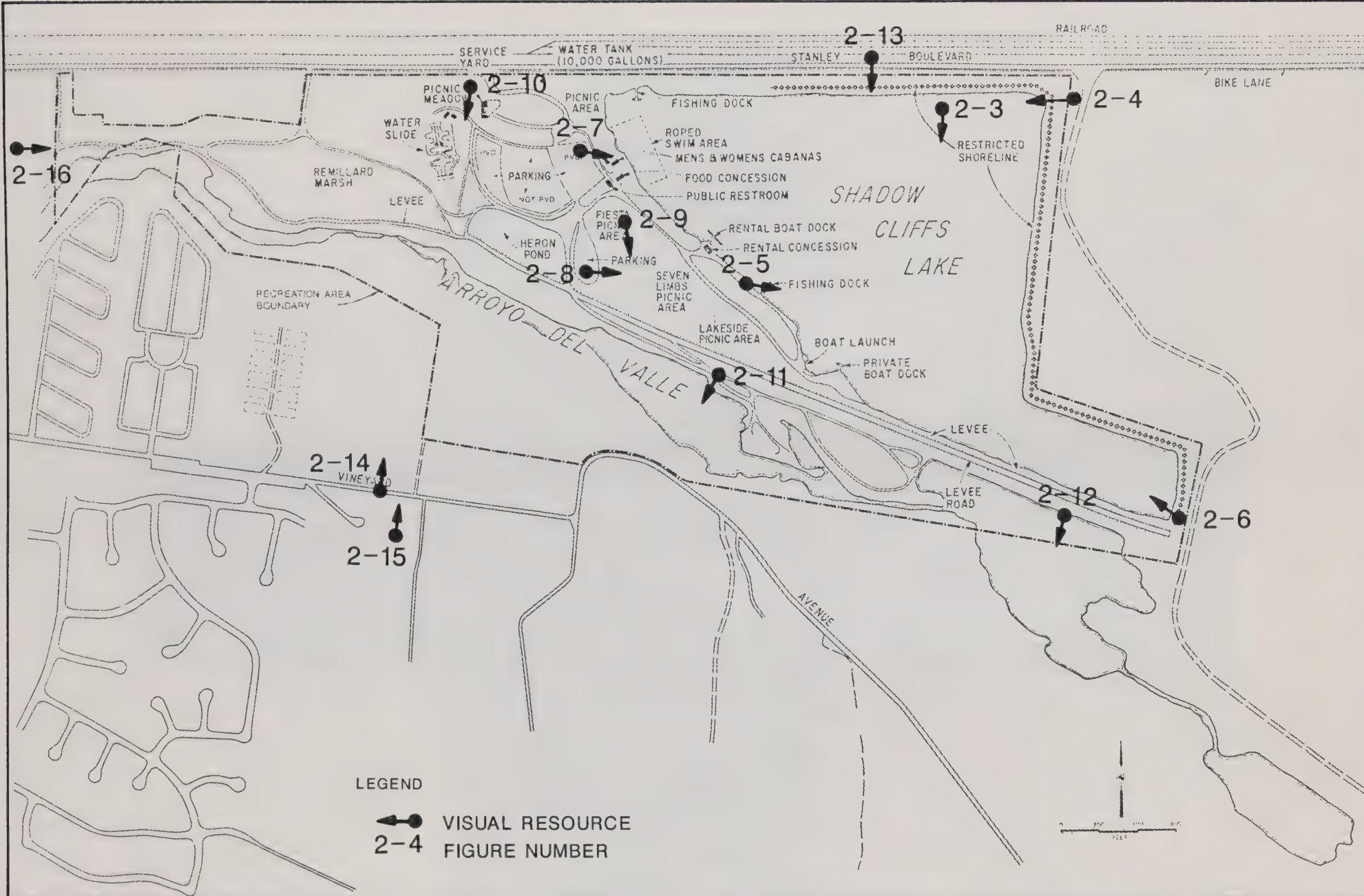


FIGURE 2-2. PHOTOGRAPH LOCATIONS

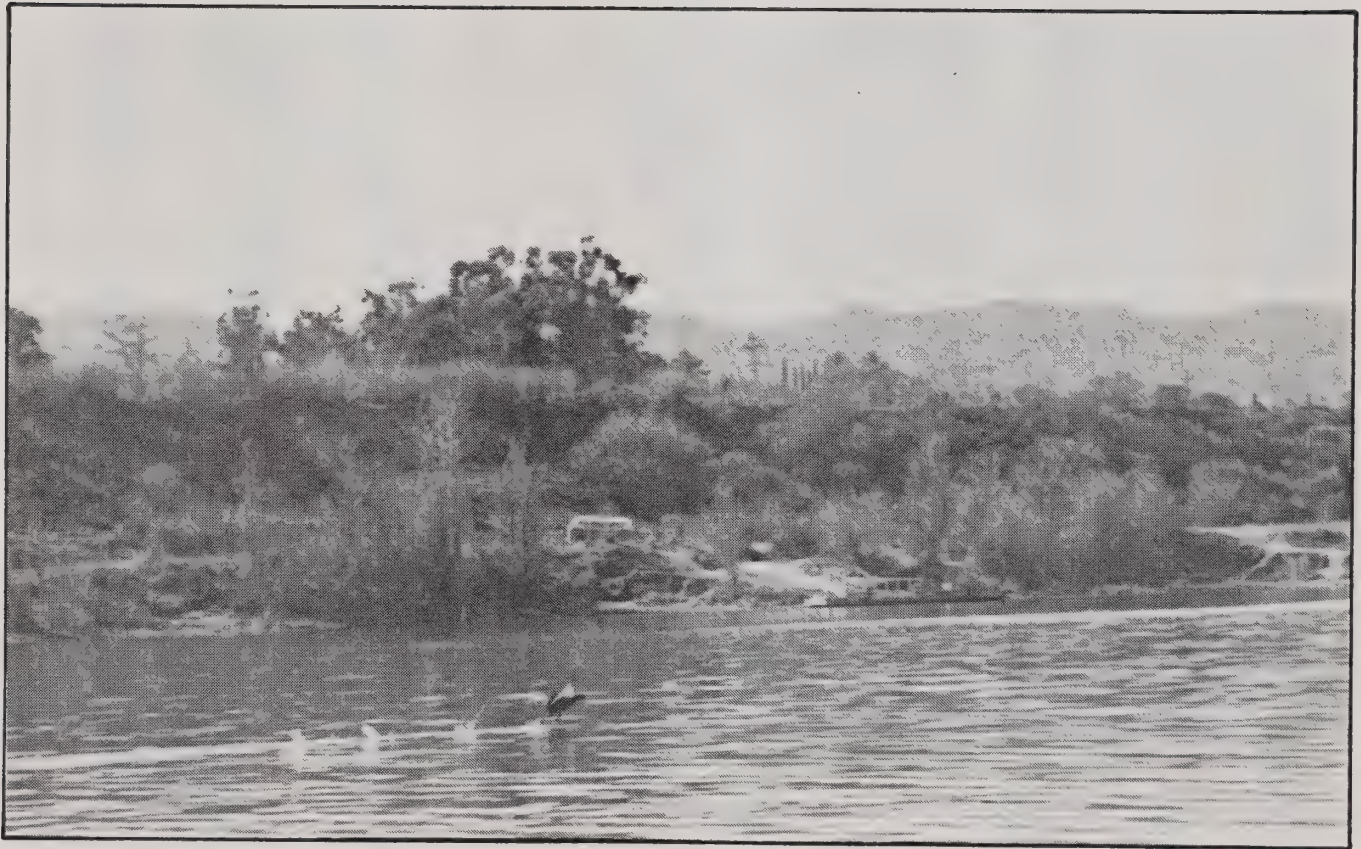


FIGURE 2-3. OFFSHORE VIEW OF SOUTH BANK



FIGURE 2-4. ELEVATED PANORAMA OF WEST BANK

the lake, recreation facilities and waterfowl. Background views include residential development to the southwest and the mountains of the Coast Range. Offshore views from the east side of the lake are similar to those from the east bank. Foreground views include the west shore with its fishing, boating and swimming facilities. Background views include the Coast Ranges.

Onshore views of the lake near a fishing pier at the southwest shoreline contain the elements which appear in Figure 2-5. An elevated vantage of the lake from atop the Arroyo Del Valle levee at the southeasternmost corner of the lake is presented in Figure 2-6. Foreground views contain elements similar to those described for Figure 2-5. Background views include the quarry operation facilities north of Stanley Boulevard.

An onshore view of the lake and swimming area is presented in Figure 2-7. Foreground views include the lake, waterfowl, recreation facilities, and the north, east, and south banks of the lake. Background views include the railroad, quarry operation facilities, and the mountains of the Diablo Range.

Picnic Area. Views from the picnic area are similar to those from the western shore as shown in Figure 2-7. Figure 2-8 shows the Lakeside Picnic Area. Foreground views from within the picnic areas include urban landscaping, picnicking facilities, waterfowl, the north face of the Arroyo Del Valle levee, and the levee access road. Background views include the Livermore Hills and residential development. Figure 2-9 presents a typical view from across the picnic area to the west. Foreground views are similar to those described above. The background view includes the backside of the waterslide hill (right hand side of photograph). Landscaped berms along the north and west edges of the picnic area obscure the parking areas adjacent to the picnic grounds.

Water Slide Area. Due to the contours of the water slide hill and the berms and landscaping surrounding the facility, the slide is visible only from the immediate vicinity north and northeast. Figure 2-10 presents a view of the waterslide from the north. The waterslide is also visible from Stanley Boulevard.

Arroyo Del Valle. Figure 2-11 presents a typical view from within the levee looking west across the arroyo. Foreground views include extensive riparian vegetation, the arroyo, and waterfowl. Background views would include agriculture, ongoing residential construction, and the Livermore Hills. Figure 2-12 shows the island in the arroyo as it appears from atop the levee directly north of the island.

Offsite Views. Views from north of the site are limited due to the steep change in topography south of Stanley Boulevard. As noted above, the lake and waterslide are visible offsite along Stanley Boulevard from the bicycle path and the



FIGURE 2-5. VIEW FROM SOUTHWEST FISHING PIER
(LOOKING EAST)

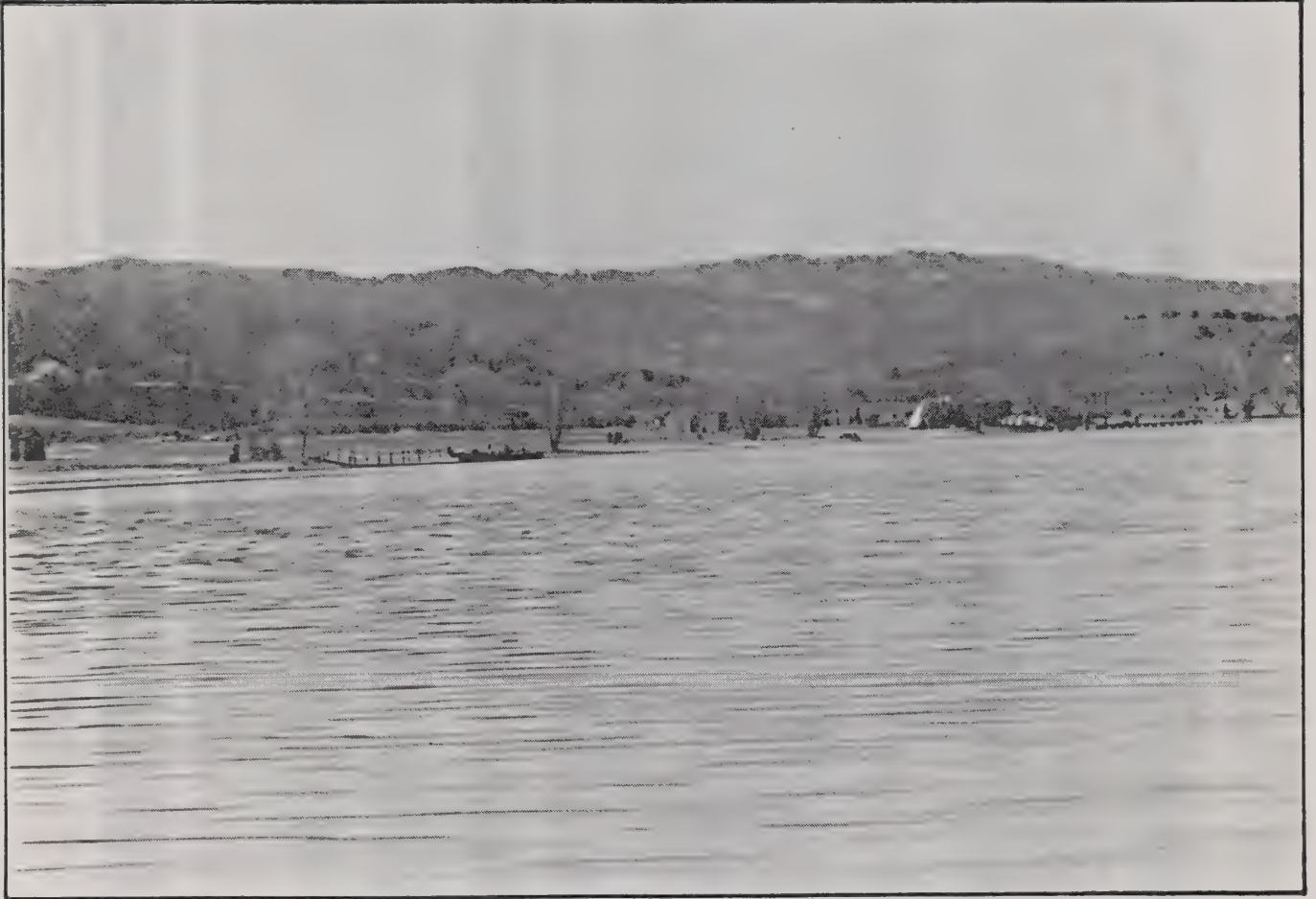


FIGURE 2-6. VIEW OF LAKE FROM ATOP LEVEE
(LOOKING NORTHWEST)



FIGURE 2-7. VIEW OF SWIMMING AREA
(LOOKING EAST)



FIGURE 2-8. VIEW OF LAKESIDE PICNIC AREA
(LOOKING EAST)



FIGURE 2-9. VIEW FROM FIESTA PICNIC AREA
(LOOKING SOUTH)

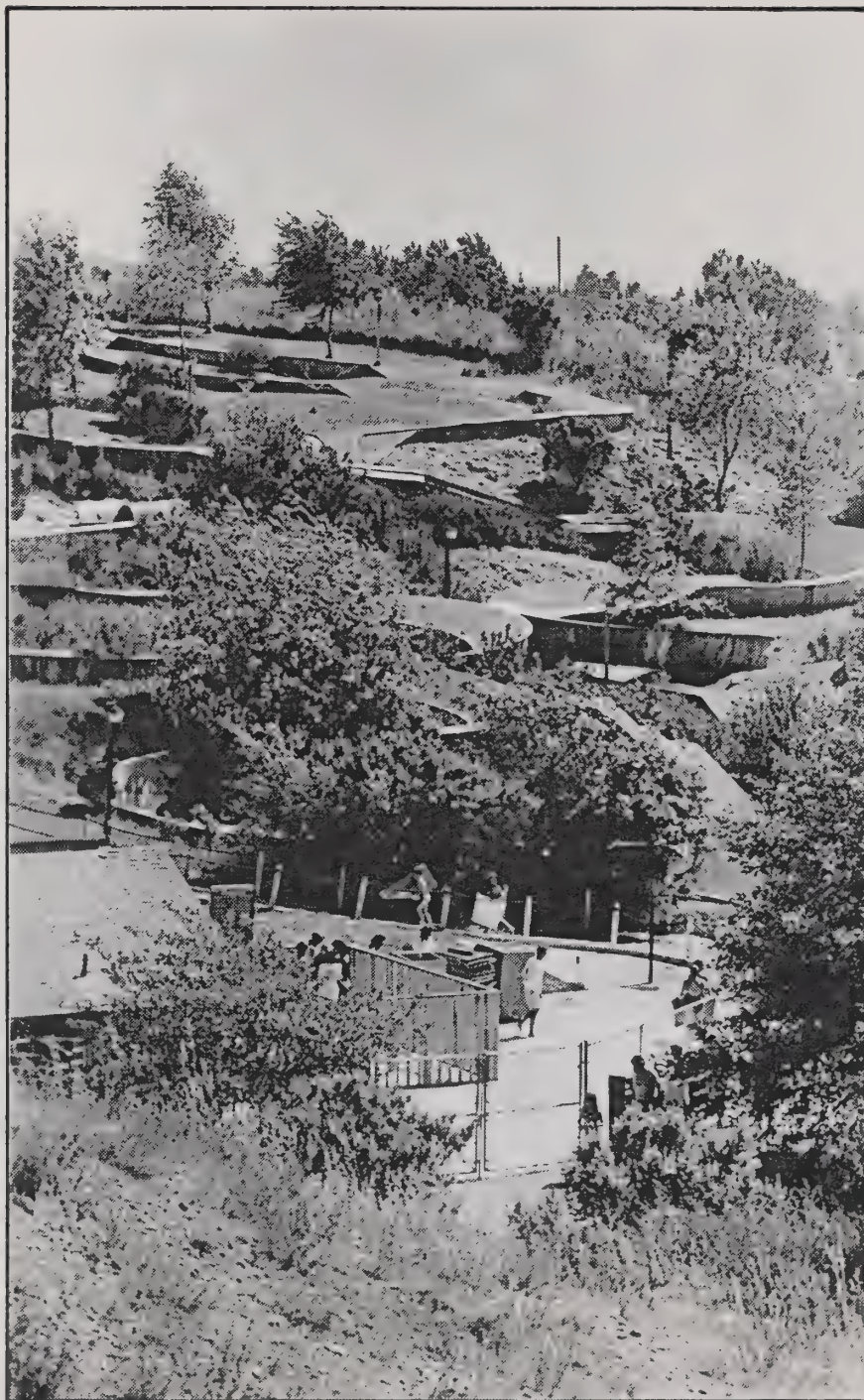


FIGURE 2-10. VIEW OF WATER SLIDE FACILITIES



FIGURE 2-11. VIEW WITHIN ARROYO DEL VALLE



FIGURE 2-12. VIEW OF ISLAND POND

southernmost eastbound lane only. Views are similar to those shown in Figure 2-4. Other portions of the park are visible from the westbound lanes of Stanley Boulevard (Figure 2-13). Foreground views are limited to the northern slope of the Arroyo Del Valle levee. Background views include the Livermore Hills and residential development beyond Vineyard Avenue.

Views from east of the site are similar to those shown in Figure 2-4.

The park is visible from several limited vantages to the south. The primary area of visual access is Vineyard Avenue (Figure 2-14). Residential development north of Vineyard Avenue is visible from many areas within Shadow Cliffs Recreation Area. Figure 2-15 provides an elevated offsite view from south of the park. The Arroyo Del Valle is visible in the lower left-hand corner of the photograph. Shadow Cliffs lake is visible in the center of the photograph.

Figure 2-16 is an offsite view from a vacant lot west of the park looking east toward the park. The park cannot be seen from this western area.

Resource Issues

- o Should the visual continuity of the rural setting be preserved?
- o Should views of industrial and urban development be shielded from visitors at Shadow Cliffs Recreation Area?



FIGURE 2-13. OFFSITE VIEW FROM STANLEY BOULEVARD
(LOOKING SOUTH)



FIGURE 2-14. OFFSITE VIEW FROM VINEYARD AVENUE
(LOOKING NORTH)



FIGURE 2-15. ELEVATED OFFSITE VIEW FROM SOUTH OF VINEYARD AVENUE
(LOOKING NORTH)



FIGURE 2-16. OFFSITE VIEW FROM WEST OF PARK
(LOOKING EAST)

Hydrology and Water Quality

Hydrology

The Alameda Creek Watershed. The Shadow Cliffs Regional Recreation Area is located within the Alameda Creek watershed. The drainage basin contains an area of 695 square miles and is located in the Coast Range to the south east of San Francisco Bay. Approximately 59 per cent of the basin is within Alameda County. Santa Clara County contains 32 percent of the basin and Contra Costa County contains the remaining 9 percent (Figure 2-17) (U. S. Army Corps of Engineers, 1978).

The headwaters of Alameda Creek originate near Mount Hamilton in Santa Clara County. The creek flows northwest for approximately 25 miles, then west through Niles Canyon for about 5 miles, meanders across the Coastal Plain, and finally empties into San Francisco Bay in the City of Fremont. The principal tributaries of Alameda Creek are Calaveras Creek in the southwest of the basin, San Antonio Creek in the southeast of the basin, and Arroyo de la Laguna in the northeast of the basin. (U. S. Army Corps of Engineers, 1978). The Arroyo de la Laguna was originally an outlet for a lake in the low-lying area of the western end of the Amador Valley. The remnants of the lake along with the surrounding wetlands remained until the early 1900s when reclamation activities and drawdown of the groundwater altered the area's drainage patterns (Brown and Caldwell, 1972.)

The Arroyo Del Valle, which runs through Shadow Cliffs Regional Recreation Area, is the largest subtributary stream in the basin. It joins the Arroyo de la Laguna about 2 miles east of Pleasanton. The drainage area of the Arroyo Del Valle is approximately 173 square miles (Figure 2-17) (U. S. Army Corps of Engineers, 1978.)

Local Surface Water. There are three storage reservoirs located within the Alameda Creek watershed: the Calaveras Reservoir, part of the San Francisco Water Department system; the James H. Turner Reservoir (San Antonio Reservoir) also part of the San Francisco system; and Del Valle Reservoir, a component of the State Water Project. Del Valle Reservoir is located on the Arroyo Del Valle and has a 77,000 acre-foot capacity (Brown and Caldwell, 1972). Due to its proximity to Shadow Cliffs and relationship to the Arroyo Del Valle, Del Valle Reservoir is the only one of the three reservoirs that directly affects Shadow Cliffs.

Del Valle Reservoir is located approximately 11 miles upstream from the confluence of the Arroyo Del Valle with the Arroyo de la Laguna. The reservoir is controlled by the Del Valle Dam and is operated for purposes of flood control, water supply, water conservation, groundwater recharge and recreation

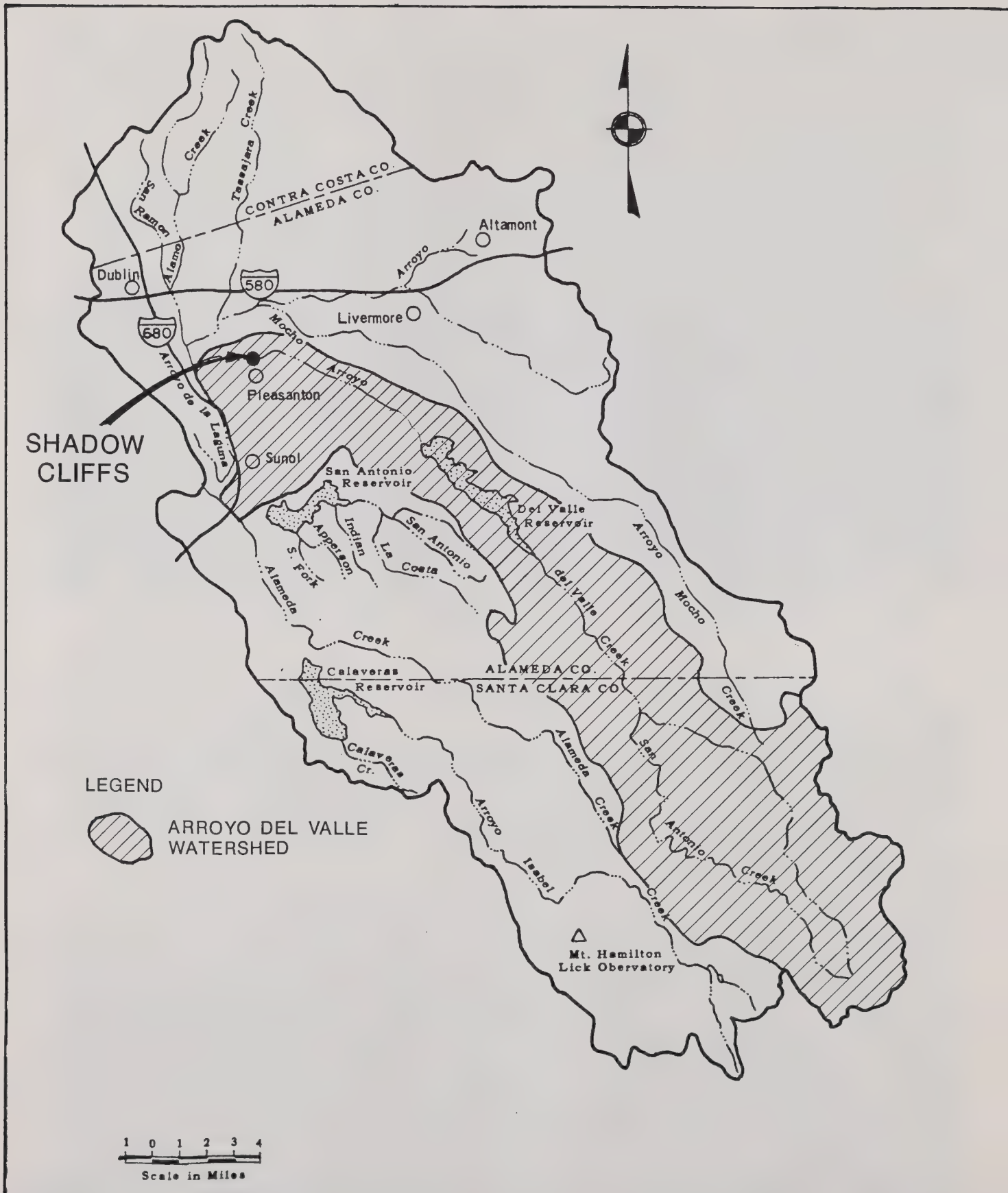


FIGURE 2-17. ALAMEDA CREEK WATERSHED

Source: Wong pers. comm.

(Corps of Engineers, 1978). In the summer, water is released from the reservoir into the Arroyo Del Valle under terms of a contract with the Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7) for recharge purposes. However, that water does not normally reach Shadow Cliffs as surface water (Killingstad, personal communication 1987).

The Arroyo Del Valle is the most important watercourse in the study area. Flows in the Arroyo Del Valle are intermittent and reflect surface runoff from major rainfall. Most of the runoff from Shadow Cliffs park drains into the arroyo (Brown and Caldwell, 1972). Within Shadow Cliffs, there are two ponded areas of the arroyo which retain surface water all year--Island Pond and Arroyo Pond. These ponds are the result of depressions left from past mining operations in the creekbed (Killingstad, personal communication 1987).

Flood Hazards. The 100-year flood zone used for planning purposes is provided in Figure 2-18 (Federal Emergency Management Agency, 1986). A 100-year flood is an event which is predicted to occur only once in a 100-year period (i.e., a 1 percent chance of occurring in any given year). It includes the entire Arroyo Del Valle channel within the park boundaries. However, the areas of the park north of the Arroyo Del Valle levee are protected from inundation in all but the most extreme flood events (100 year+). The entire park site and the entire Amador Valley would be inundated by the failure of Del Valle Reservoir (Alameda County Planning Department, 1986).

The entire south side of Shadow Cliffs was inundated by a storm in the winter of 1955-56. A major storm that year caused a breach of the Arroyo levee (since repaired) during which an estimated 5,000 acre-feet of water flooded what is now the recreation area (Stanford Research Institute, 1956). The magnitude of that storm is estimated to be between a 50- and 100-year flood (Wong, personal communication 1987).

Shadow Cliffs Lake Water Source. Shadow Cliffs Lake is operated by the EBRPD for recreation purposes. The lake contains approximately 2,500 acre-feet with a surface area of approximately 90 acres. The lake is located in a former gravel mining pit with a surface elevation of approximately 330 feet above mean sea level. The lake surface is approximately 30 feet above groundwater levels. During the September 1985 to September 1986 water year, inflow to the lake consisted of approximately 711 acre-feet. Nearly 73 percent of the inflow was reclaimed washwater from local gravel operations, while the remaining 27 percent was from precipitation. During the same water year, approximately 790 acre-feet of outflow occurred. About 51 percent of the outflow was from lateral groundwater movement, while the remaining 49 percent was due to evaporation (Killingstad, personal communication 1987).

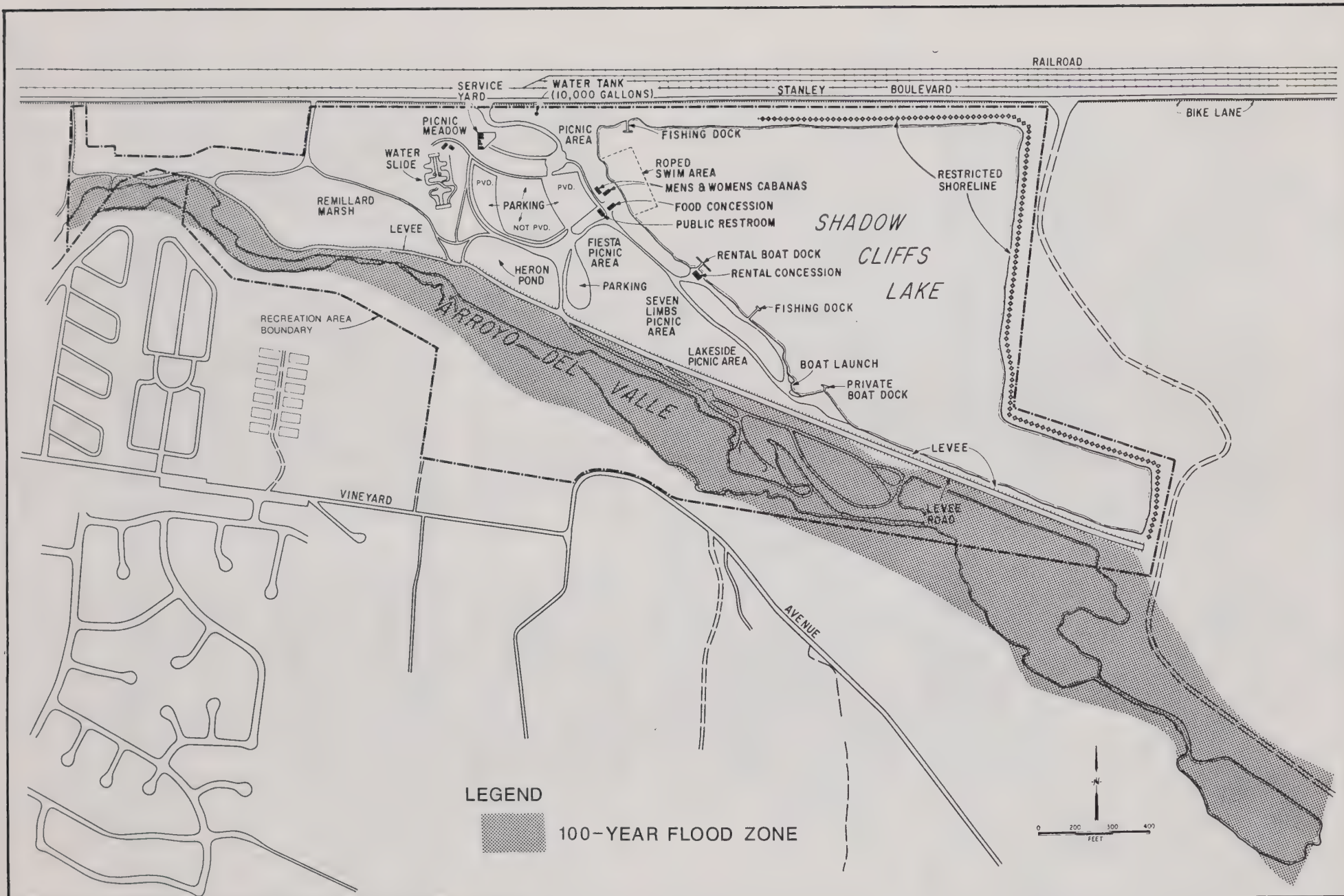


FIGURE 2-18. 100-YEAR FLOOD ZONE

Source: Federal Emergency Management Agency 1986

Other surface water in the park includes the 0.25-acre Heron Pond and a 2-acre wetland area on the western end of the park. Both of these areas dry out during years of low precipitation (East Bay Regional Park District, 1980). Adjacent surface water bodies include several water ponds associated with gravel mining operations to the north and southeast of the park. Surface water levels within a 2-mile radius of the park range from 245 feet to 370 feet (U. S. Geological Survey, 1985 [Plate 2]).

Local Groundwater. The study area overlies the Livermore Valley Ground Water Basin (Figure 2-19). The basin occupies approximately 65,300 acres within the northern and eastern portions of the Alameda Creek watershed. There are two major geologic sources of groundwater in the basin: alluvial deposits which make up the valley floor, and the underlying Livermore Formation. The surficial valley-clay materials range in thickness from 0 to 500 feet. These materials are composed of unconsolidated sand, gravel, silt, and clay. Both confined and unconfined groundwater is located in these areas. Properly designed wells generally yield sufficient water for high capacity use in these materials. The Livermore Formation ranges in thickness from 20 feet to nearly 4,000 feet. The formation occurs generally as beds of clayey material in a sandy clay matrix. Deep well yields are generally adequate for agricultural, municipal, and most industrial purposes (Department of Water Resources, 1974).

The water-bearing geologic units in the basin have been described as multi-layered systems having an unconfined upper aquifer over a sequence of leaky or semiconfined aquifers. Groundwater movement is downslope toward the southwest-trending longitudinal axis of the valley, then in a westerly direction toward the Bernal Subbasin. The various groundwaters of the basin commingle in this subbasin and then move in a southerly direction across the Verona Fault, out of the Livermore Basin and into the Sunol Basin (Department of Water Resources, 1974).

Restriction of the horizontal movement of groundwater is caused by faults and lateral variations in the thickness and permeability of the aquifer materials. Restriction of the vertical movement of groundwater is due to the separations between the two water-bearing units -- the valley fill (alluvial) materials and the Livermore Formation. Each of these units has differing permeabilities and internal stratifications within it. Hydraulic continuity between the two units is limited to either those areas where the Livermore Formation is in direct contact with overlying streamcourses of the Arroyo Del Valle and the Arroyo Mocho or where wells penetrate both units. The degree of hydraulic continuity between subbasins is primarily controlled by faulting (Department of Water Resources, 1974).

The Livermore Basin is divided into 12 subbasins. The Amador Subbasin completely underlies Shadow Cliffs park (Figure 2-19) The Amador Subbasin contains approximately 18,361

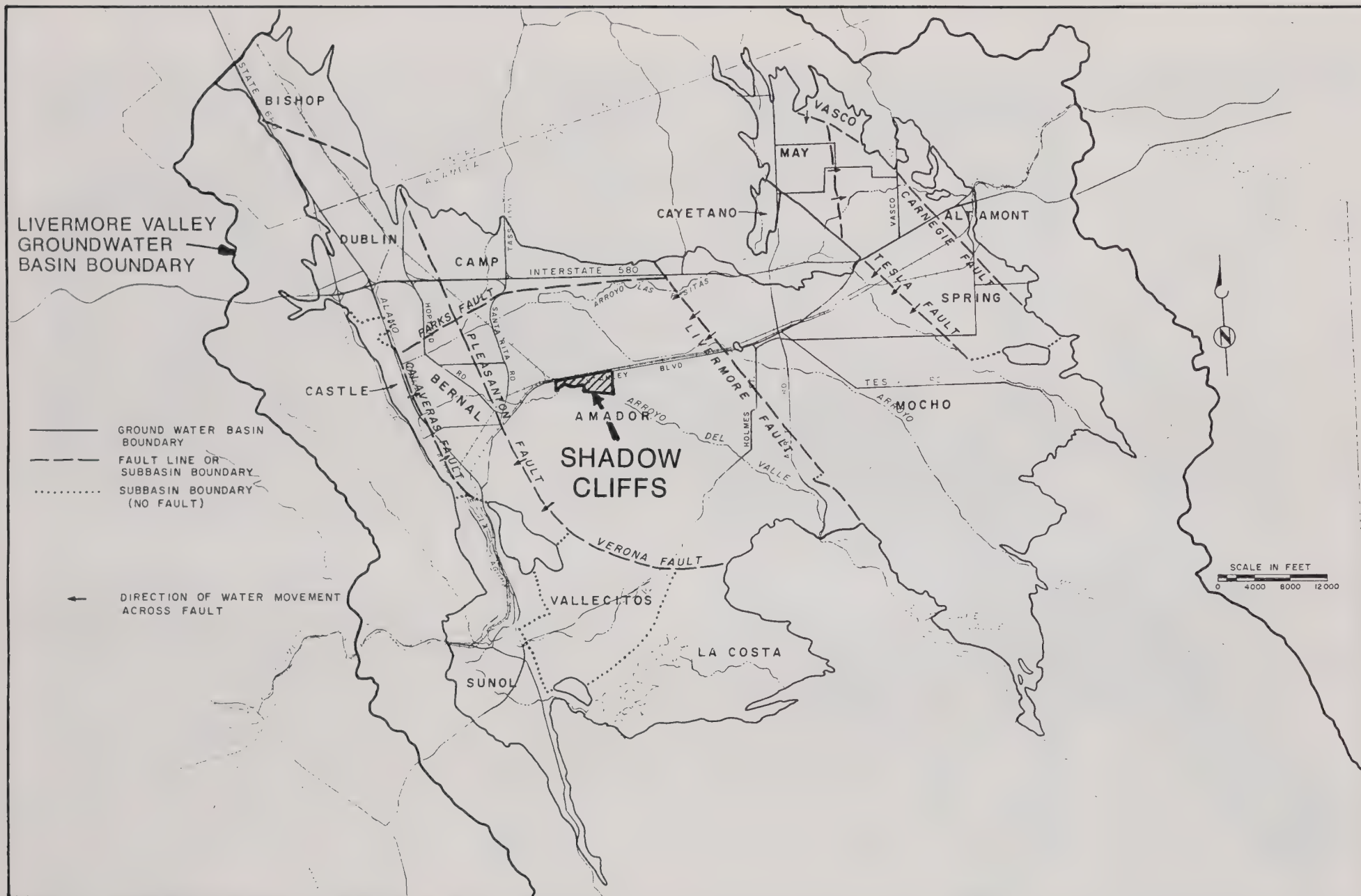


FIGURE 2-19. LIVERMORE VALLEY GROUNDWATER BASIN HYDROLOGY

Source: Brown and Caldwell 1972

acres. The water-bearing zones of the valley-clay materials in the Amador Subbasin are sandy gravel and sandy clayey gravel separated by silty clay. The deepest valley-fill within the Livermore Basin occurs within the Amador Subbasin (300-500 feet). Groundwater occurs in both confined and unconfined conditions. Unconfined conditions occur in near-surface zones, principally the Arroyo Valle channel and the uppermost aquifer in the center of the subbasin. Confined groundwater occurs elsewhere in the subbasin. The Livermore Formation underlies the subbasin. The Amador Subbasin contains the greatest number of high production wells in the basin. Well yield is significantly higher from the valley-fill zones than from the Livermore Formation. Well water is used primarily for agriculture, gravel mining operations, and residential use (Department of Water Resources, 1974).

Aquifers in the Subbasin are up to 150 feet thick and surrounded by 50-foot-thick clay beds. Many of these aquifers merge near the Arroyo del Valle in a 300-foot-thick deposit of sandy gravel (Department of Water Resources, 1974).

Depth to groundwater ranges from 10 to 150 feet in the subbasin (Department of Water Resources, 1974). Depth to groundwater near Shadow Cliffs is approximately 30 to 50 feet below the surface (Alameda County Flood Control and Water Conservation District Zone 7, 1982). Groundwater movement generally consists of inflow from the northeast and outflow through the western boundary of the subbasin (Department of Water Resources, 1974). Recent monitoring results indicate that while groundwater levels in the Livermore Valley Basin have generally risen from 1975 to 1982, levels in the Amador Subbasin show no upward or downward trend (U. S. Geological Survey, 1985).

Groundwater levels near Shadow Cliffs have fluctuated greatly in the past 40 years. Between the early 1940s and the early 1960s, groundwater levels dropped between 75-125 feet through withdrawals. In the 1960s, better water management practices and a program of groundwater recharge has brought levels back up significantly, but not to their historic levels. Table 2-1 shows the changes in groundwater at three different locations, approximately 1 mile from Shadow Cliffs.

Functions of Zone 7. Zone 7 of the Alameda County Flood Control and Water Conservation District was formed by voter approval in 1957 for purposes which include water supply, water resources management, flood control, and wastewater management. Zone 7 encompasses an area of approximately 425 square miles in the southeastern portion of Alameda County. Most of its activities are concentrated in the Livermore-Amador Valley within the cities of Livermore, Pleasanton, Dublin and the adjacent unincorporated areas (Mar, 1986). Major actions must be approved by both the Zone 7 board of directors and the board of directors

Table 2-1. Historic Groundwater Elevations

	Well Location		
	Intersection of Moore Road and South Pacific Railroad	County Fairgrounds	Stanley Boulevard Midway Between Airport and Shadow Cliffs
1940s Level	345 feet	330 feet	375 feet
1962 Level	270 feet	220 feet	250 feet
1983 Level	305 feet	310 feet	335 feet

Source: Alameda County Flood Control and Water Conservation District Zone 7

for the Alameda County Flood Control and Water Conservation District (ACFCWCD) (Alameda County Planning Department, 1986).

When Zone 7 was formed, its service area relied on groundwater as the sole source of water supply (Zone 7, 1986). The area was faced with a severe groundwater overdraft. Today, Zone 7 utilizes three sources for its water supply. The primary source is the State Water Project (SWP), which supplies Delta water via the South Bay Aqueduct for storage and distribution at Del Valle Reservoir. Zone 7's maximum entitlement to this SWP water is 46,000 acre-feet per year. The total estimated delivery for 1986 was 23,600 acre-feet. Based on applicable Department of Water Resources operating criteria, the actual anticipated entitlement available to Zone 7 is estimated to be 31,000 acre-feet per year. This amount, in conjunction with the other available supplies, is expected to be sufficient through the year 2006 (Mar, 1986).

The two other sources of water available to Zone 7 are local runoff into Del Valle Reservoir and the local groundwater basin. The Zone's water rights to runoff within Del Valle Reservoir have averaged 8,000 acre-feet per year. The potential annual groundwater yield from the Central Basin area (Amador, Bernal, Mocho, and Sunol subbasins) is estimated to be 12,000 acre-feet per year (Mar, 1986; Horn, personal communication 1987). This yield is fully utilized by other basin users at present (Mar, 1986). Those users include the City of Pleasanton, the California Water Service Company, and various gravel mining companies (Wong, personal communication 1987).

Until 1975 groundwater remained a primary source of the Zone 7 water supply. After completion of various water supply facilities in 1975, groundwater served a secondary standby function from 1976 to 1984. In the summer of 1985, groundwater was used as a supplement to other sources and amounted to a total of approximately 7 percent of the Zone's treated water. (Zone 7, 1985.)

Between 1962 and 1983, Zone 7 implemented a groundwater recharge program to correct overdraft conditions (Zone 7, 1985). An estimated 120,000 acre-feet were recharged into the basin during this period (Zone 7, 1984). By 1984 balanced basin conditions had been achieved so that average annual natural recharge about equaled the average annual withdrawal (Zone 7, 1986). The two major components of this program were the importation of surface water for recharge (Zone 7, 1986) and the coordination of contracts between groundwater users to limit the amount pumped from the basin (Killingstad, personal communication 1987; Wong, personal communication 1987). Future Zone 7 operations may include groundwater extraction in emergency conditions. Such extractions will, however, be balanced by increased artificial recharge (Mar, 1986; Zone 7, 1986).

One necessary aspect of achieving a balanced basin remains unfinished. Negotiations between Zone 7 and quarry operators are continuing toward an agreement as to how present operations and eventual reclamation of quarry sites can best be coordinated to assure stable groundwater conditions (Wong, personal communication 1987).

Quarry Operations and Water Resources. Quarry operations consisting of 4,180 acres surround Shadow Cliffs and are expected to continue for approximately 50 years. Mining is limited to that upper layer of gravel deposits within the uppermost water bearing zone at the aquifer (Alameda County Planning Department, 1979). Eventually, as mining proceeds, sufficient groundwater is encountered so that further excavation is uneconomical (Killingstad, personal communication 1987). Zone 7 and other recharge operations can also interfere with mining operations (Department of Water Resources, 1980).

The area's aggregate companies (Kaiser Sand and Gravel, Lone Star Industries, and Rhodes and Jamieson, Ltd.) prepared a reclamation plan in January 1977 which addressed concerns about the long-term effects of gravel mining on groundwater. In 1979, a Draft Environmental Impact Report on the Livermore-Amador Valley Quarry Reclamation Plan was published (Alameda County Planning Department, 1979). In 1981, the Specific Plan for Livermore-Amador Valley Quarry Area Reclamation was prepared and adopted by the Alameda County Board of Supervisors (1981).

The Reclamation Plan and resulting Specific Plan propose ultimate management of the area as a "chain of lakes." Under the chain-of-lakes concept, the reclaimed quarries would become a series of 11 connected lakes surrounding the present mining area. Figure 2-20 is an approximation of the existing distribution of land and water in the Specific Plan area. Figure 2-21 illustrates the changes which would ultimately result when the quarry pits were reclaimed (ca. 2030). The lakes would contribute to the hydrologic continuity of groundwater aquifers, serve as water storage reservoirs, provide groundwater recharge areas, and expand water-related recreation opportunities.

The reclamation of quarry operations would proceed in a staged or sequential manner so that, over time, increasingly larger areas become committed to water uses and decreasing areas remain undisturbed or actively mined (Figure 2-22). Depending on an area's geologic stability, potential land uses can range from industrial to open space. Land use designations are not part of the Specific Plan.

Facilities for water management and conveyance include two diversion structures (one at Arroyo Del Valle) and a variety of conduits and channels between existing and planned water bodies. Two features of the chain-of-lakes concept are of particular importance for Shadow Cliffs. First, two lakes would be developed on the Arroyo Del Valle southeast of the park, just north

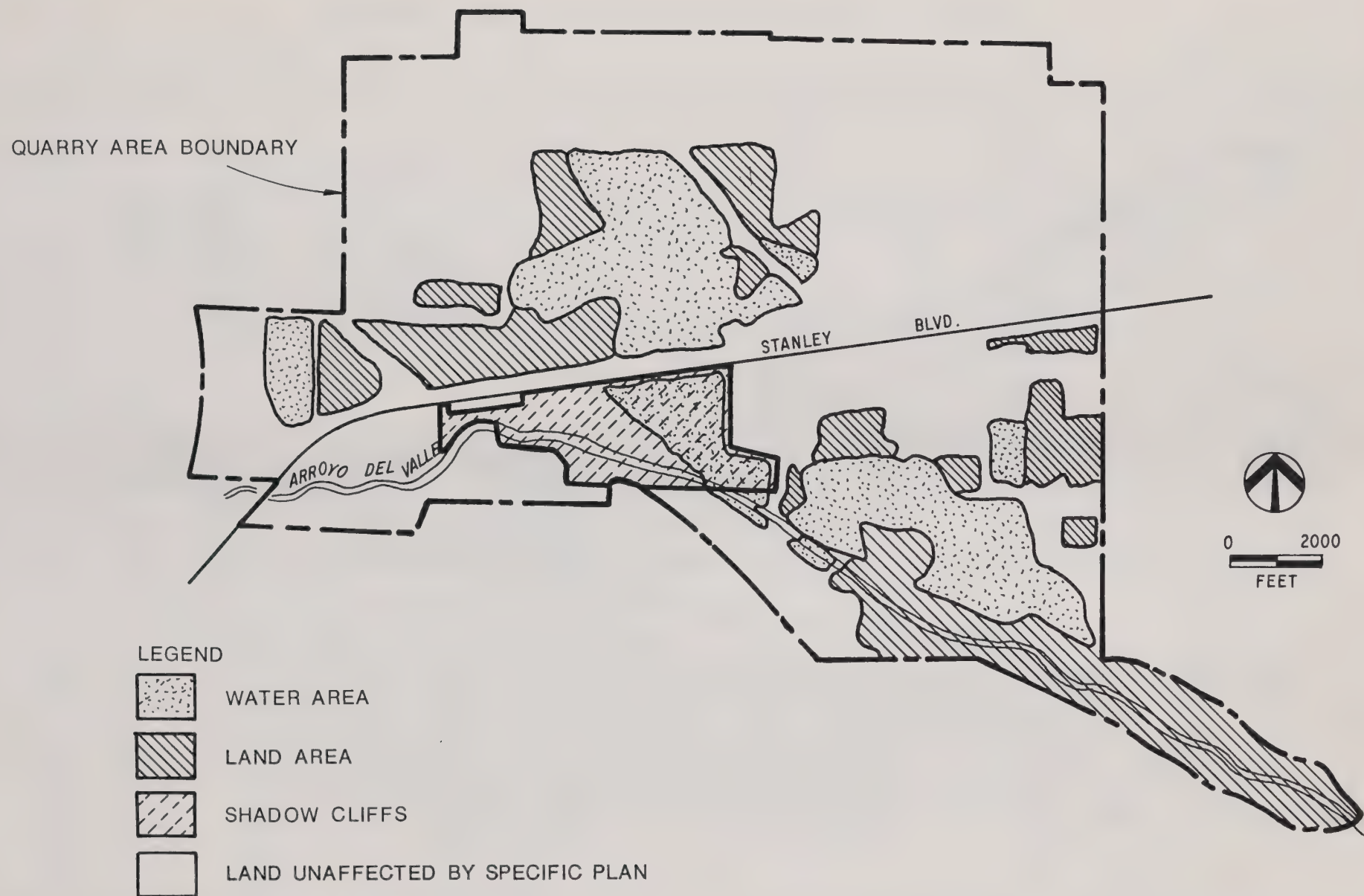


FIGURE 2-20. EXISTING DISTRIBUTION OF LAND AND WATER
IN RECLAMATION PLAN AREA

Source: Jones & Stokes Associates 1987

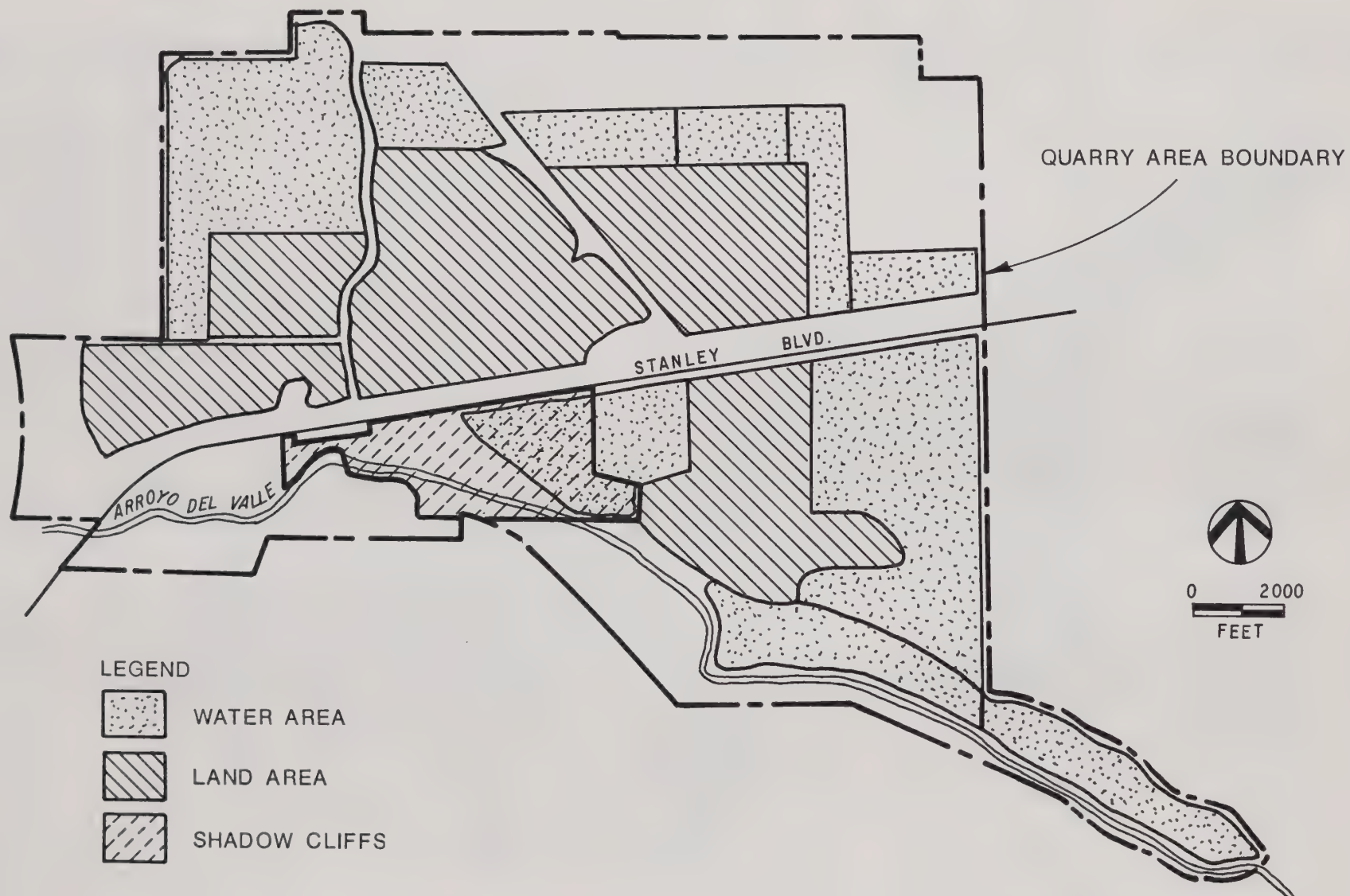


FIGURE 2-21. COMPLETED CHAIN OF LAKES

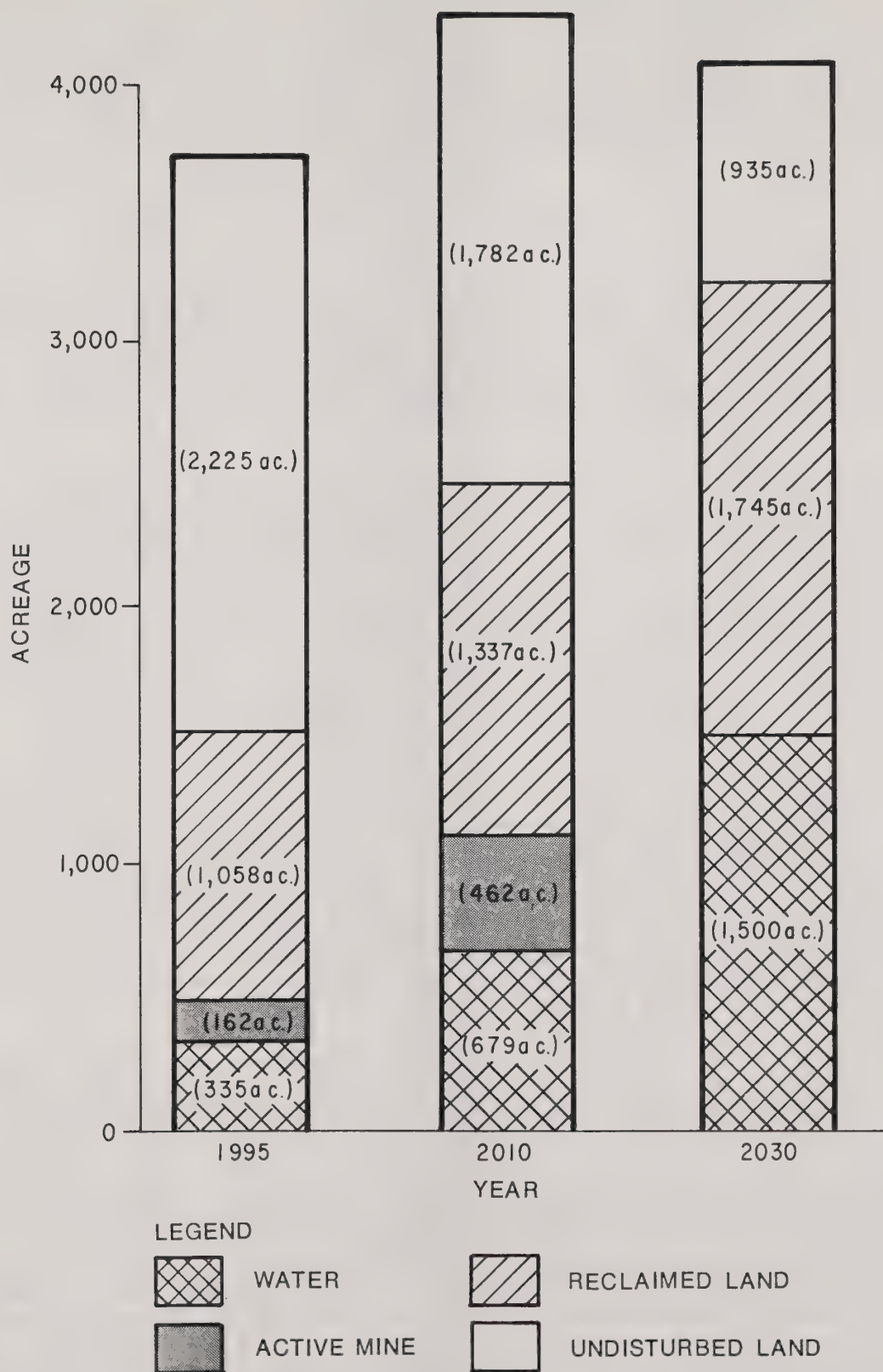


FIGURE 2-22. CHAIN OF LAKES STAGED LAND USE

Source: Modified from Alameda County Board of Supervisors 1981

of Vineyard Avenue. Development of these lakes would require relocating the Arroyo Del Valle channel and disturbance of the existing riparian habitat. Second, the Specific Plan discusses an optional plan to create a tenth lake immediately east of Shadow Cliffs Lake which could be an extension of the Shadow Cliffs Regional Recreation Area (Alameda County Board of Supervisors, 1981).

Water Quality

Temperature and pH. Surface water temperature varies seasonally, ranging from 8°C in December and January to a high of 24° C in July. Thermal stratification begins in spring, as surface waters begin to warm, becoming less dense (lighter) than the colder water below (Figure 2-23).

Summer thermal stratification is broken up in the fall by wind action after the epilimnion (upper layer) cools to approximately the same temperature as the hypolimnion (lower layer) and water densities are equalized. Gradually the entire lake begins to circulate as the winds create water currents across the surface and compensating currents develop across the lake bottom. Water that has remained trapped in the lake depths all summer again comes in contact with the surface layers where free and dissolved carbon dioxide has an opportunity to escape and the dissolved oxygen supply is replenished (Bennett, 1970).

Dissolved oxygen levels remain high in the epilimnion during stratification, but decrease rapidly as depth increases below the thermocline. The hypolimnion approaches anoxic conditions during stratification, caused by decomposition and respiration of organic matter. Fish typically cannot survive in the hypolimnion during stratified conditions. In most of the lake, the hypolimnion contains only the bottom 3 meters of the lake. At the southernmost edge of the lake, the hypolimnion ranges to the bottom 7 meters of the lake.

The pH of the surface water is slightly alkaline, varying from 8.0 to 8.7 in 1985. The pH decreases slightly to 7.0-7.1 near the bottom, a result of decreasing oxygen (Vieth, 1973).

Biological Parameters. Water visibility is very good most of the year, decreasing slightly with increased algal growth in the summer. Algae and other aquatic plants are stimulated by increased nitrate and phosphate levels in the reservoir. Nitrate levels appear to be highest in and around the swimming area in summer. Phosphates, which are frequently present naturally only in limited amounts, probably enter the reservoir from fertilizers which are applied to the large lawn in the main visitor use area. Phosphates contribute to the growth of aquatic organisms, especially in impounded waters. Heavy algal blooms have been observed in lakes where the phosphate concentration exceeds 0.03 mg/l (Bell, 1986).

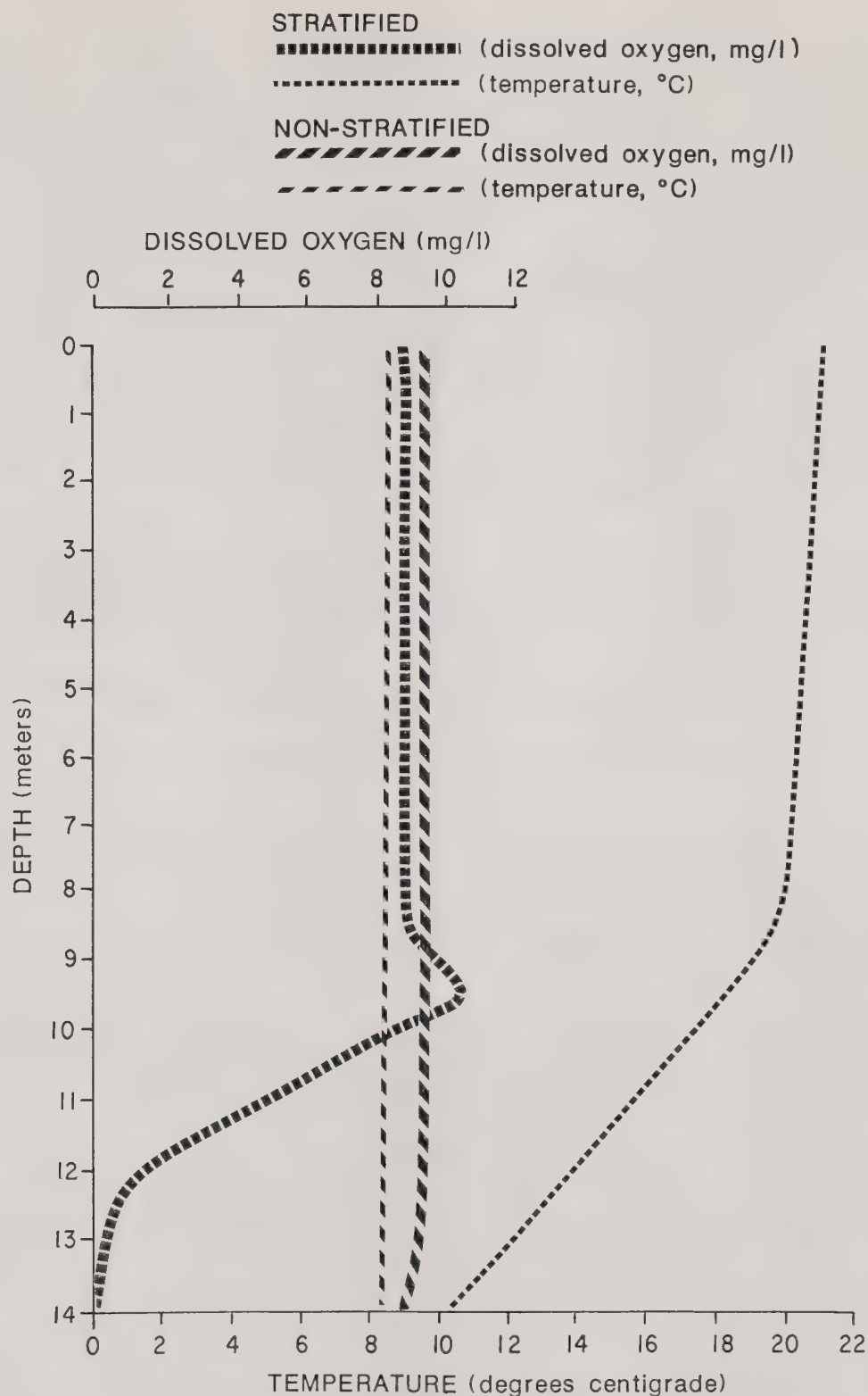


FIGURE 2-23. TYPICAL OXYGEN TEMPERATURE PROFILE IN SHADOW CLIFFS LAKE DURING STRATIFIED (JULY, 1985) AND NON-STRATIFIED (DECEMBER, 1985) CONDITIONS

A principal water quality problem is swimmers' itch, the common name for schistosome dermatitis. Swimmers' itch is a skin irritation resulting from penetration of the skin by the larval stage of certain trematode worms belonging to the family Schistosomatidae. The definitive, or final hosts, are species of aquatic birds such as grebes or ducks, and, to a lesser extent, mammalian species. Aquatic snails serve as the intermediate host. The snails are supported by the occurrence of milfoil in Shadow Cliffs Lake which, in turn, is supported by phosphates released in the lake. After entering the snail's body, the larvae (called miracidia) mature and release another larval stage (cercariae) which emerge from the snail and attempt to find and penetrate the skin of an aquatic bird. Unwary swimmers can be the victim of these nonselective cercariae (Figure 2-24). The skin reaction is short-lived (7-14 days) with no long-term health effects.

Swimmers' itch was first documented in Shadow Lake in 1975, and has recurred almost every summer since then; outbreaks typically occur in response to warming conditions in the reservoir.

To date, several strategies have been implemented to eradicate or control swimmers' itch at Shadow Lake:

- o introduction of redear sunfish as a predator of snails (1979);
- o physical removal of aquatic weeds (snail habitat) from the immediate swim area (1979-1986); and
- o application of copper sulfate crystals (molluscicide) to kill snails (1986).

These programs have not been successful in controlling swimmers' itch. The most effective method of controlling the parasite may be aquatic vegetation removal, thereby reducing the habitat necessary for the survival of snails.

In 1987, a new technique of aquatic plant control called "rotovation" was begun. This technique involves tilling of the reservoir bottom to destroy vascular plant roots. This method was recently used with apparent success in the state of Washington.

Resource Issues

- o How will rising groundwater from development of the chain-of-lakes concept affect septic tanks and other facilities at Shadow Cliffs?
- o How will development of the proposed chain of lakes affect the water supply and water quality at Shadow Cliffs?

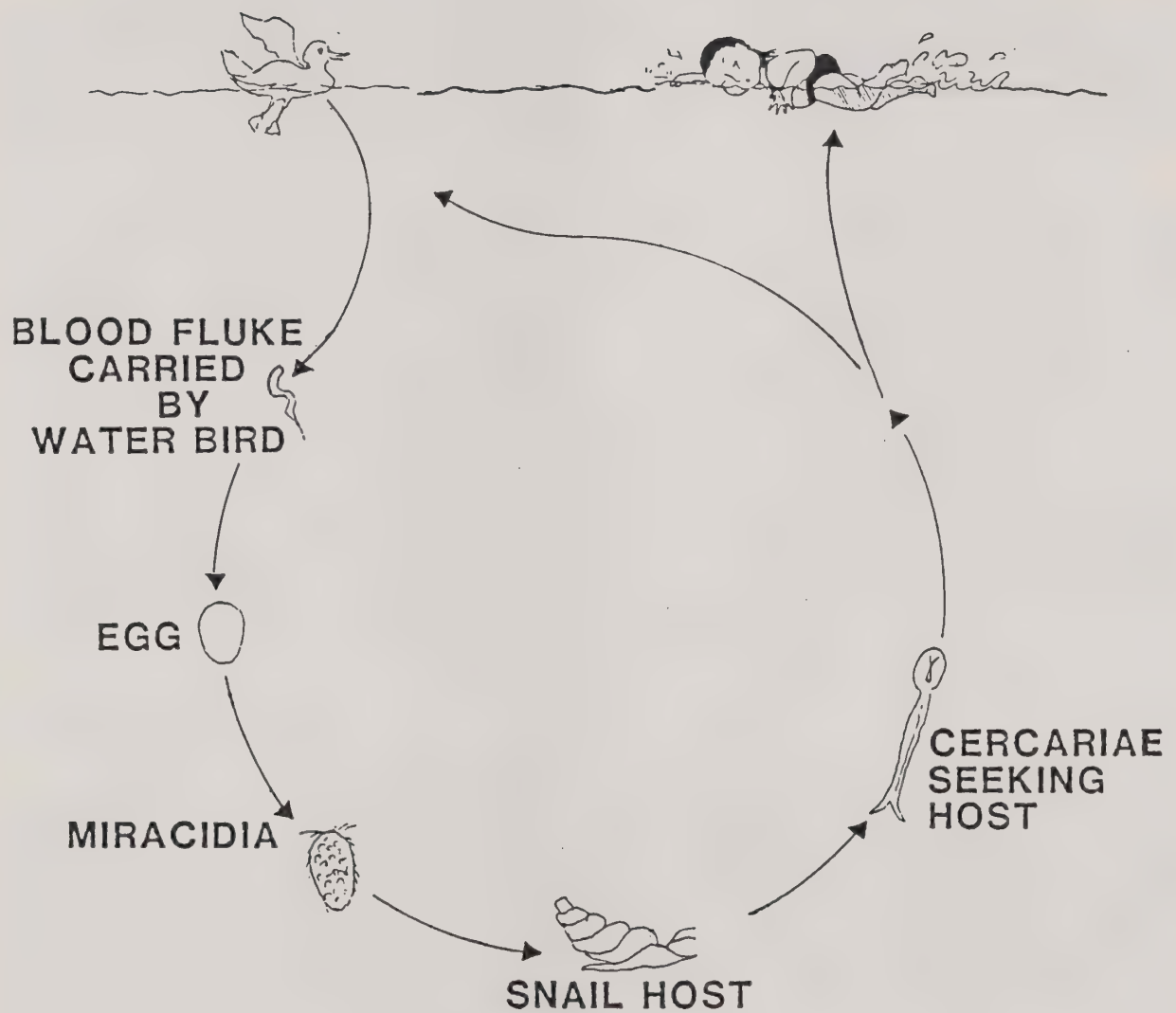


FIGURE 2-24. LIFE CYCLE OF SWIMMERS ITCH CERCARIAE

- o How will the proposed chain of lakes relocation of Arroyo Del Valle affect vegetation at Shadow Cliffs?
- o How can cercariae be controlled?
- o What are effective methods for milfoil control?
- o What steps should be taken to limit nutrient influx into the lake?

Geology and Soils

Regional Setting

Shadow Cliffs is situated in the central portion of the Livermore-Amador Valley, an erosional and structural depression formed by complex faulting of the sedimentary and metamorphic country rock. This area, near the margin of the two colliding crustal plates, remains tectonically active (i.e., the underlying rock structure remains capable of movement).

The valley is underlain by several hundred feet of alluvial deposits of both the recent period and Pleistocene/Pliocene epochs: stratified gravels, sands, and silts. Clay lenses are generally absent in the Shadow Cliffs area but are found extensively in the valley deposits further north. The uppermost strata consist of a well-graded silt, about 10 feet thick at Shadow Cliffs, that has weathered to a very productive loam. Near Arroyo Del Valle, this layer is thin, yet it thickens to 12 feet at the north property line, and further thickens to the north. At Shadow Cliffs, little of this "overburden" remains, since 100-foot-deep excavations have occurred in the dominantly sand and gravel deposits. However, some or all of the levee separating Shadow Cliffs Lake and Arroyo Del Valle appears to be comprised of this silty overburdened material.

Earthquake Hazards

Shadow Cliffs, like much of the San Francisco Bay Area, is in a region of very high earthquake hazard. The site lies 3.5 miles east of the easternmost major branch of the San Andreas fault system, the Calaveras Fault. Numerous active or potentially active faults are within 100 km (approximately 161 miles) (Figure 2-25). Most of these are also part of this major right-lateral fault system where the Pacific Plate slides northerly against the North American Plate.

Surface Rupture. Although no faults are known to pass through the site (Hurt, 1985; Wesson et al., 1975; Jennings, 1975), several small faults are in the immediate vicinity. These include the Pleasanton Fault 2.5 miles to the west and at least two faults in Livermore Valley a similar distance to the east, all of which pass through the valley alluvium. Faulting at the project site is improbable though not impossible.

Ground Shaking. The maximum intensity of ground shaking expected at the site from earthquakes in the region is very high: IX on the Modified Mercalli scale ranging from I to XII. This would result from a magnitude 7.3 earthquake along the Calaveras Fault (Table 2-2). An earthquake of the maximum magnitude expected on the Hayward Fault would result in slightly less intensive shaking at the site; the maximum expected

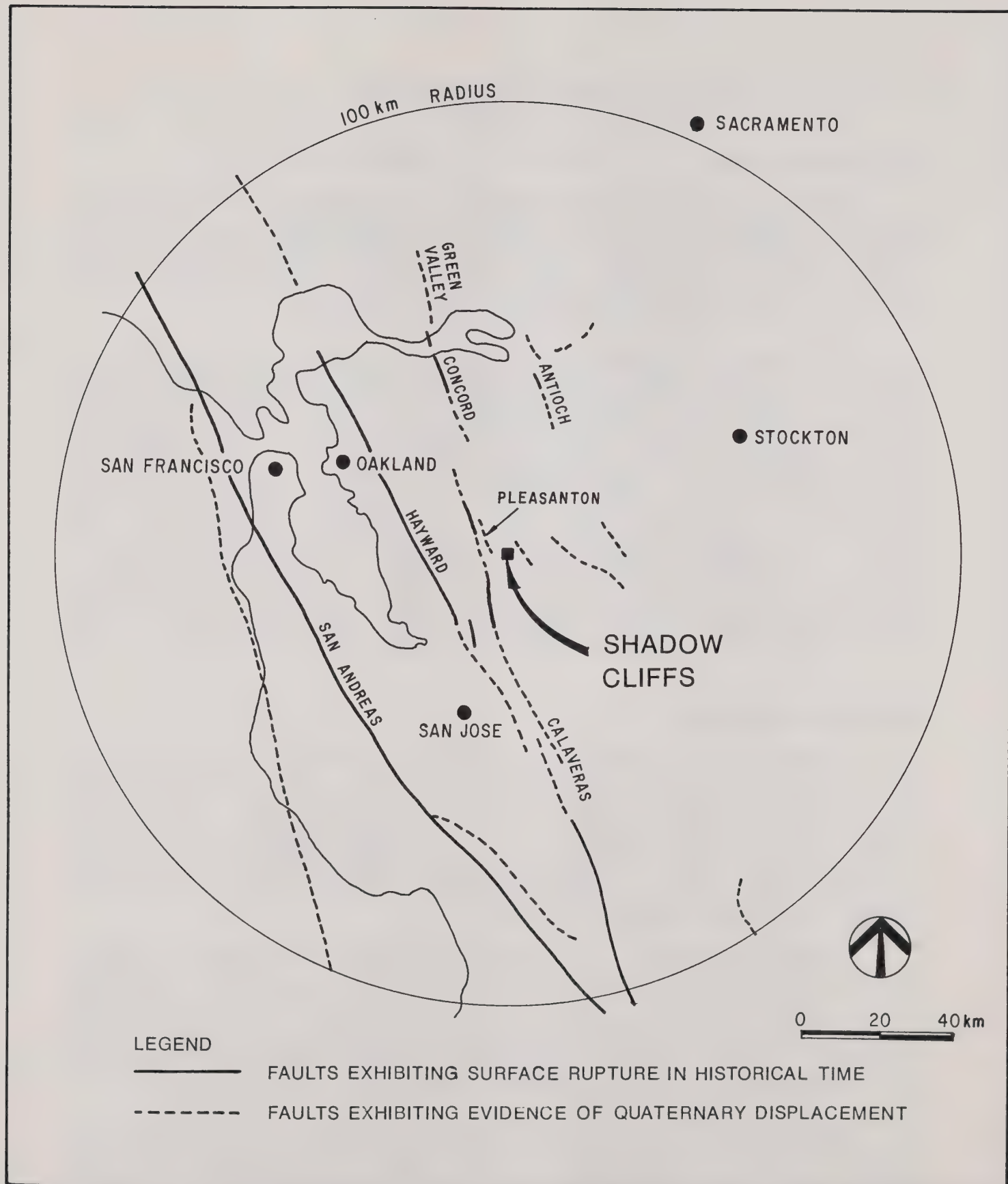


FIGURE 2-25. KNOWN ACTIVE FAULTS WITHIN 100km OF SHADOW CLIFFS

Table 2-2. Maximum Expected Earthquake Intensity
and Liquefaction Opportunity at Shadow Cliffs

Fault	Estimated Maximum ^c Magnitude Earthquake	Distance from Site mi (km)	Rock Acceleration ^b	Intensity ^a	Liquefaction Opportunity ^e
Livermore Valley faults	none	--	--	--	--
Calaveras	7.3	3.5 (5.6)	0.55	IX.2	yes
Hayward	7.5	11 (17.6)	0.41	VIII.75	yes
San Andreas	8.5	29 (46)	0.28	VIII.2	yes
Pleasanton	5.7 ^d	2.5 (4.0)	0.38	VIII.6	yes
Antioch	6.6	20 (32)	0.17	VII.8	yes
Concord	6.3	24 (38)	0.12	<VII.5	yes
Green Valley	6.6	37 (59)	0.08	<VII.5	no

^a Assumes saturated alluvium at Shadow Cliffs.

^b Derived from Mualchin and Jones 1987 (in press).

^c From Wesson et al. in U. S. Geological Survey 1975.

^d Derived from source above (using same methodology).

^e Derived from Wilson and Keefer in U. S. Geological Survey 1985.

earthquake on the San Andreas Fault itself would have a considerably less, but nonetheless damaging effect (intensity VIII).

The maximum expected intensity of IX would cause general panic in the area and considerable damage in structures built especially to withstand earthquakes. Reservoirs as well as utility, transportation, and service systems would sustain serious damage. Emergency services, food, and portable water might be rendered unavailable for 1-2 days.

Liquefaction. The site is within the liquefaction opportunity zone of maximum expected earthquakes on at least the six closest active faults (Table 2-2). Any saturated clay-free unconsolidated sands or silts at the site may liquefy during a major shaking event. Where such materials were supporting heavy loads, such as large buildings or the arroyo levee, differential settling and structural damage or failure could occur.

The liquefaction susceptibility of the site is not known. The presence of saturated alluvial deposits and general absence of a clay constituent in the vicinity suggests the possible presence of materials susceptible to liquefaction at the site. However, observed in-place alluvial deposits are somewhat consolidated and weakly cemented and would therefore not be expected to liquefy. Fill structures comprised of the site's natural silt overburden, such as the arroyo levee, are potentially susceptible to liquefaction.

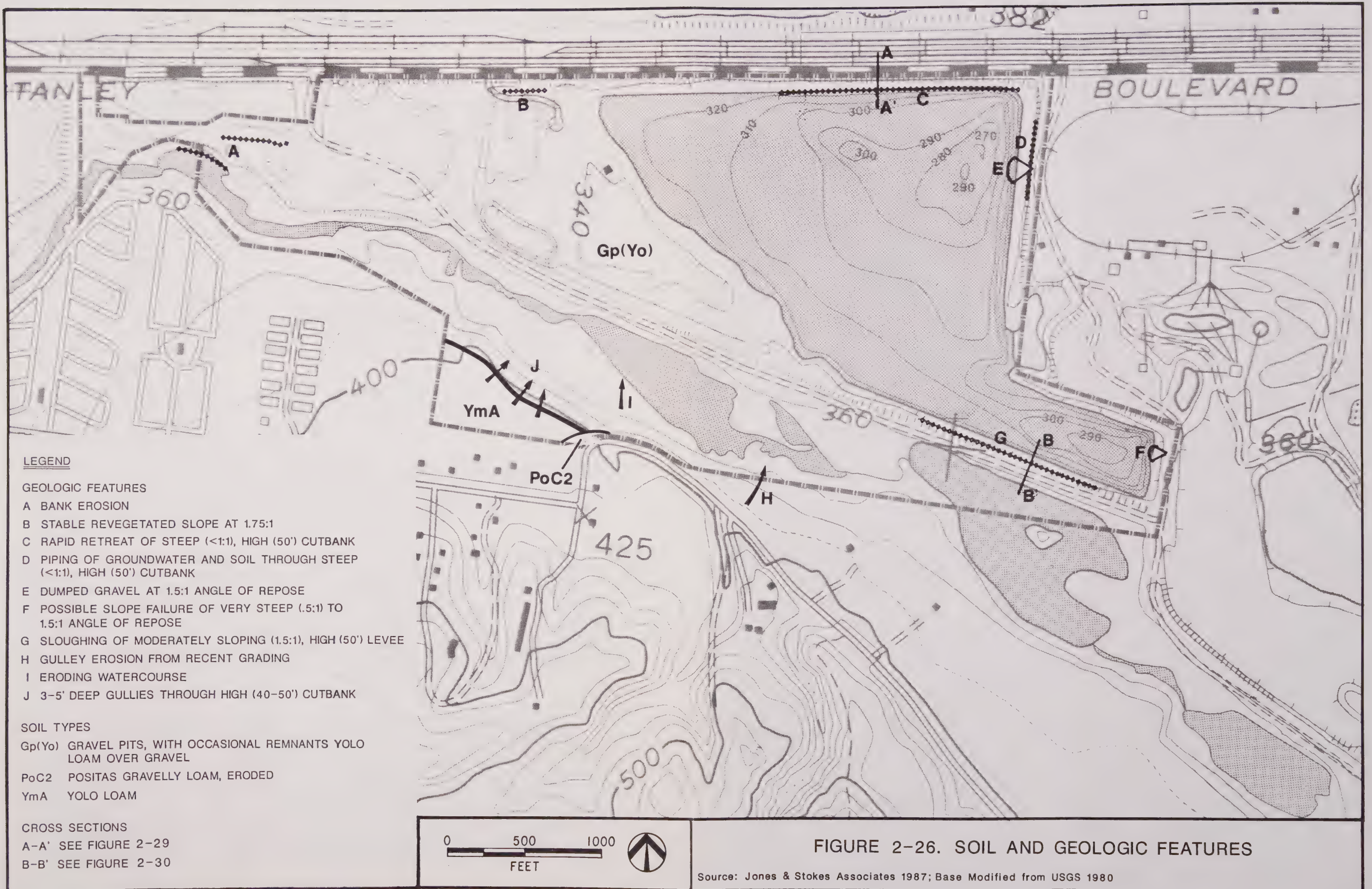
The lake waters at the site could be set in motion by intense ground shaking and could oscillate for several hours after the earthquake event. Amplitudes of this wave action could be sufficient to cause boat and marina damage and significant bank erosion and secondary slope failure.

Slope Failure. The site is within the landslide opportunity zone for maximum expected earthquakes on all of the faults shown in Table 2-2 (Wilson and Keefer, 1985). This implies that susceptible slopes could be expected to fail during such an event.

Landslide susceptibility of the site is relatively high, where steep, long-cut slopes are present or where fill slopes are saturated. The presence of such conditions on the site is shown in Figure 2-26. This potential is discussed in detail in the following section.

Slope Stability

Mining of the site's aggregate resource has resulted in the presence of inherently unstable slopes in several locations. No major slope failure (slide or slumping) has been observed or



reported. A major earthquake could result in a sudden, substantial advancement of the slope erosion/failure processes.

Quarry Cutbanks. Quarry cutbanks on the north and east margin of the park lake generally range from steep (1 horizontal: 1 vertical) to very steep (0.5:1); see Figure 2-26.

Stanley Boulevard Cutbank. The slope below Stanley Boulevard, especially near the northeastern corner of the park lake, is undergoing fairly rapid surface erosion and retreat toward the roadway. Slopes range from 1:1 to nearly vertical. At one location, the eroding cliff face has encroached under a chain link fence and into the edge of a bike lane paralleling the vehicle lanes (Figure 2-26). The Alameda County Geologist (Denehy, personal communication 1987) attributes this retreat entirely to surface erosion during rainstorms. Wave action in this windward reach of shoreline could possibly be a contributing cause undercutting the slope and accelerating the surface erosion process. Significant erosive wave action has been observed in aggregate pits throughout the area (Shannon and Wilson, 1987).

The cliff retreat has been gradual; no mass slope failure is evident. However, 1- 2-foot thick pieces of the silty overburden do slough when the erosional retreat of the underlying gravel deposits is sufficient.

Geotechnical studies of similar material on adjoining lands indicate that landslides as deep as 6-15 feet (horizontal dimension of mass failure) should be considered possible, and that quarry operation structures should not be placed within 20 feet of these cliff faces (Shannon and Wilson, 1987).

The cliff retreat into Stanley Boulevard can be expected to continue unless large-scale abatement action is instituted. Large and dangerous gaps in the Stanley Boulevard bike lane and roadway may eventually develop, demonstrating the inherent geologic instability of this steep quarry cutslope in conjunction with the recreational lake use of the quarry pit. Since the cliff retreat has been gradual and has not involved large, sudden mass movement, the Alameda County Geologist has recommended that the county public works department defer remedial action (Denehy, personal communication 1987).

Eastern Cutbanks. Steep cutslopes ranging from 0.65:1 and 1:1 above the northeastern portion of the park lake, and up to a very steep 0.5:1 above the southeastern bay, constitute the eastern boundary of the park property. "Piping" or erosive bleeding-out of groundwater from lands to the east is occurring along this bank. This phenomenon results in localized slope failures ranging from those of minor importance to those with the potential to cause substantial gully development. Quarried aggregate has been dumped from above into one or two of the larger gullies in an apparent attempt to arrest further

development. With one possible exception, no mass failures of these slopes have been observed, although dumped rock creates an appearance of failure.

Quarry Cutbank Stability. According to a slope stability analysis for the adjoining Lone Star quarry, based on the standard engineering safety function of 1.0, stability of 100-foot-high cutbanks in the site's alluvial materials should be assured by slope configuration no steeper than 1.5:1 (Shannon and Wilson, 1982). This is a function of estimated ground acceleration at the site due to a maximum probable earthquake on the Calaveras Fault. However, Shannon and Wilson have apparently underestimated the maximum probable ground acceleration (estimated at 0.4 g compared to an estimate of 0.55 g based on Mualchin and Jones, 1987). This fact, and the public nature of the park, suggests that slopes of 1.75:1 may be a more appropriate design standard for any future cutslope alterations or annexations at Shadow Cliffs. Slopes of 1.75:1 and 2:1 are being implemented in some reclamation plans as part of the chain of lakes development (Cotter, personal communication 1987).

The recommended maximum slope of 1.5:1 is further supported by onsite observations of the angle of repose of loose aggregate dumps (or slides) as shown on Figure 2-27. The site's alluvial material, once deprived of in-place cementation, comes to rest under the force of gravity at a slope of approximately 1.5:1. Cutbank slopes of lesser steepness would therefore have little impetus to fail. Site observations also reveal the stability and revegetated nature of slopes at 1.75:1 above the main park entrance road. Virtually none of the high quarry cutslopes found at Shadow Cliffs are sufficiently gentle to assure long-term stability of the present configuration.

Arroyo Del Valle Levee. As noted earlier, the levee between Arroyo Del Valle and Shadow Cliffs Lake may be composed entirely of silty material stripped away in other areas as overburden above aggregate deposits.

Significant soil sloughing of the levee's north face is occurring in the lower 20-25 feet above the lake shoreline. This sloughing has been sufficient to recently eliminate a fishing access trail bordering the lake just above the shoreline. The levee faces (prior to sloughing) were sloped at about 1.5:1, but the soil sloughing phenomenon is gradually steepening the lower north face. Numerous small slumping and sloughing areas also occur on this face above the major sloughing zone. Vegetation on the upper face is still generally present, but it is being naturally eliminated in the lower sloughing zone.

The south face of the levee is heavily vegetated and no evidence of slope failure is observable.

The cause of the soil sloughing from the lower, north slopes is not evident. An observed 15-foot difference in

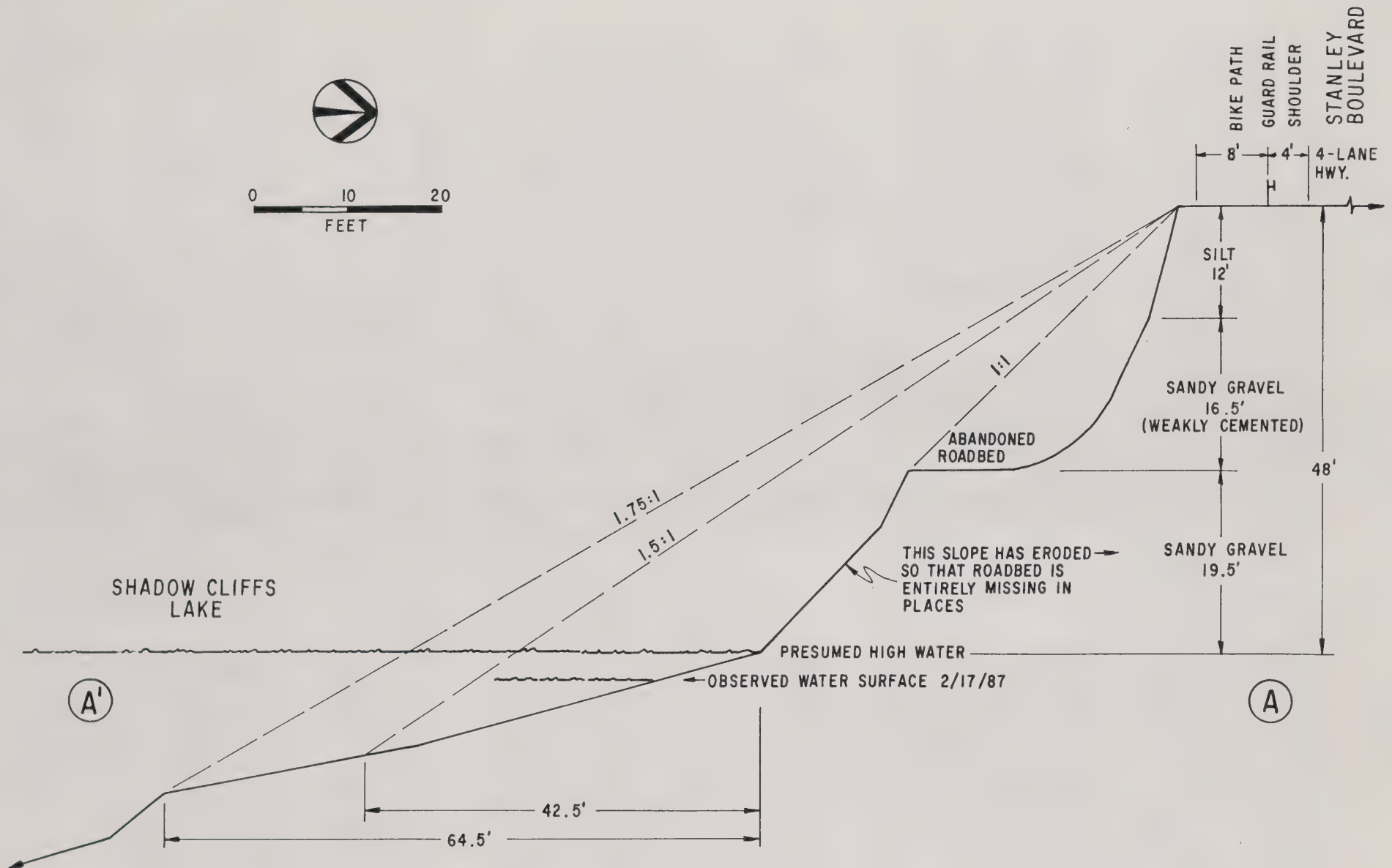


FIGURE 2-27. CROSS-SECTION: ERODING CLIFF BELOW STANLEY BOULEVARD

surface water levels on either side of the levee indicates one potential cause for the sloughing (Figure 2-28). Although undercutting by waves and boat wakes could be a contributor, no zone of active wave erosion has been noted. Moreover, the lake's shoreline is leeward of the 50-foot-high levee, so that significant wind-wave action is not generally present. The most substantial wave action occurs during the annual 2-day motor-boat races. No apparent undercutting occurs.

The higher water surface level in Arroyo Del Valle implies a water table gradient and consequent groundwater flow toward the lake. The rate of flow appears to be minor, since the 15-foot water surface differential persists. This groundwater movement would tend to keep soils on the lower 15 feet of the northerly levee face in a near-saturated condition, substantially reducing their strength. Sloughing up to and somewhat above this zone can be expected. The problem may be further aggravated by the persistence of moist conditions caused by reduced solar energy impinging on the north face.

The magnitude of the sloughing phenomenon (Figure 2-28) is not enough to suggest a threat to the levee integrity. This situation could change if major slumping of the levee occurred during a large earthquake. Slumping could result from liquefaction, lack of sufficient strength due to saturated conditions, or both. Shannon and Wilson have found that levee slopes of 1.5:1 and water levels similar to those at Shadow Cliffs would be sufficient to provide an adequate safety factor during the maximum probable earthquake for levees that are composed of compacted aggregate (compaction to 79 percent relative density) (Shannon and Wilson, 1982). They have not evaluated the stability of levees composed of silt overburden, as may be the case for the subject levee. Failure of portions of the levee during a major earthquake event should be considered possible, unless detailed geotechnical evaluation indicates otherwise.

Mineral Resource Development Activities on Adjoining Lands

Lands south of Arroyo Del Valle and the park property are generally not suitable as sources of aggregate and are being converted to residential uses.

Mining of the lands to the north and east of the site is planned to continue for several decades. This mining would produce about 400 million tons of aggregate for urban development in the Bay Area (Alameda County Planning Department, 1979). The area is recognized by the State Geology and Mining Board as an important mineral resource that should be considered for availability by local agencies in the development of the San Francisco-Monterey Bay Area (Stinson et al., 1983).

A reclamation plan (Bissell and Karn, 1986) and slope stability analysis (Shannon and Wilson, 1982) for the Lone Star

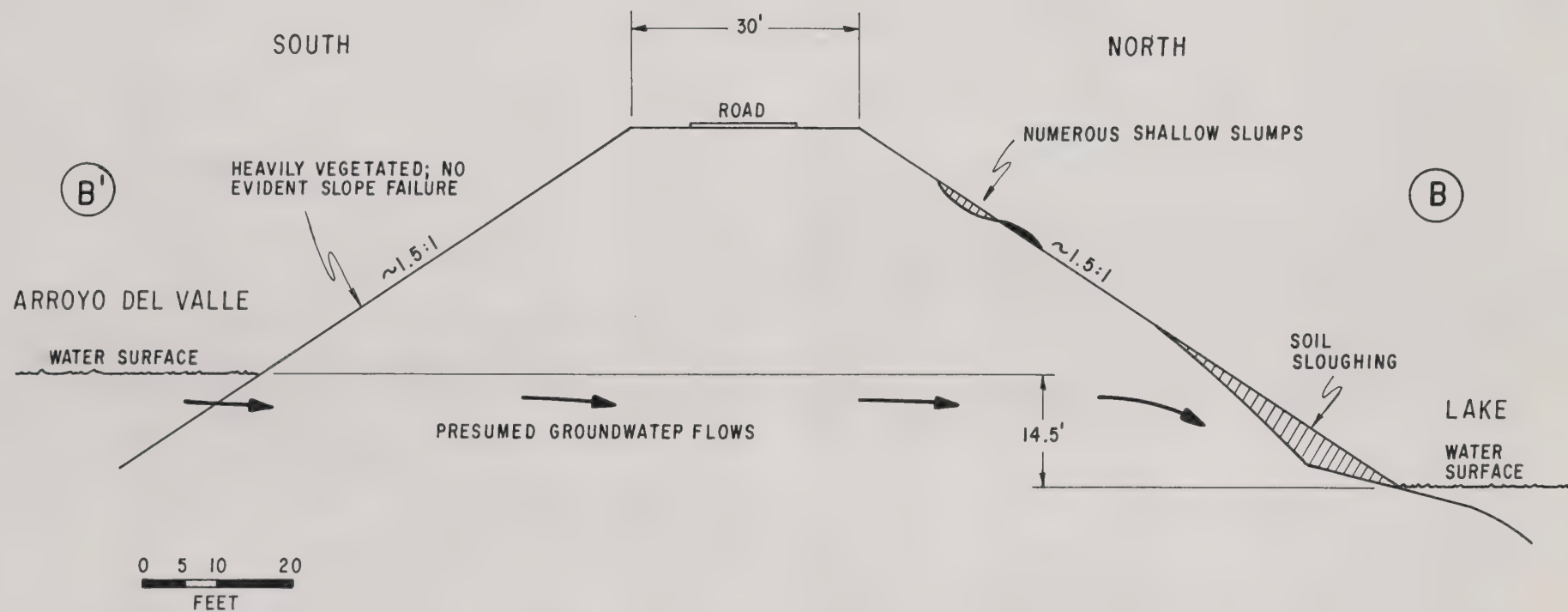


FIGURE 2-28. CROSS-SECTION: LEVEE BETWEEN SHADOW CLIFFS LAKE AND ARROYO DEL VALLE

quarry have been submitted to Alameda County. Those lands immediately east of the central portions of Shadow Cliffs Lake now used for mining plant operations, are ultimately planned for quarrying. Lands immediately east of the southeastern lake bay are planned for use as settling ponds to receive "fines" from the aggregate washing process. Lone Star's geotechnical consultant has recommended that final quarry cutslopes generally be no steeper than 1.75:1. This is considerably less steep than the slopes which presently surround the lake.

Soil Resource

Since most of the recreation area has been excavated for aggregate production, a natural soil mantle occurs only on a few scattered remnant areas and on the nearly level grassland south of Arroyo Del Valle in the south central portion of the property (Figure 2-27). Since the silty alluvium/soil overburden was apparently used to construct the arroyo levee system, the levees also provide a productive soil resource.

Productivity. The primary southern grassland soil (Yolo loam) is a very good agricultural soil in terms of both cultivation and pasture (Table 2-3). It has the highest Soil Conservation Service Land Capability Unit rating possible (I) and would be considered a "prime" agricultural soil under all definitions.

The secondary grassland soil (Positas gravelly loam), much of which is utilized for a roadway, is not prime. Compared to the Yolo loam, it is relatively impermeable, gravelly, droughty, and infertile. Although it is theoretically irrigable, growth performance would be relatively poor.

Erosion Hazard. The Positas soil is subject to considerable erosion where disturbed, while the Yolo loam is relatively stable in terms of exposure from cultivation. Nonetheless, severe erosion gullies are developing in the margin of the southern grassland Yolo soil as a result of its topographic position (a terrace some 40-50 feet above the arroyo channel) and the increase in runoff from urbanization to the south. Urbanization typically causes a doubling or tripling of peak runoff compared to agricultural or wildland conditions. Where this increased runoff must descend rapidly to the receiving watercourse, the result is severe channel scour or the creation of new channels. These outcomes can be prevented by providing stormwater detention on the developing lands, providing channel armoring and stream flow energy dissipation, or both. Such efforts are not apparent in this situation, and severe gully erosion can be expected to continue or increase on the parklands south of the arroyo.

Table 2-3. Soil Characteristics

Map Symbol	Name/Texture	Acreage	Land Capability Unit	Crop/Pasture Suitability ^d	Erosion Hazard	High Water Table?	Hydrologic Soil Group ^b	Subsoil Permeability	Shrink-Swell Potential	Bearing Capacity ^c (strength)
Gp (Y0)	Gravel pits (Yolo loam overburden)	--	VIII (III) ^a	VP (F-G) /VP (F-G)	(slight) ^a	(no) ^a	A (A) ^a	moderate to ^a very rapid	(low) ^a	(4) ^a
YmA	Yolo loam (2-3 percent slope)	--	I	VG/VG	slight	no	A	moderate	low	4
PoC2	Positas gravelly loam (2-20 percent slope), eroded	--	IV	VP-P/F	high	no	D	very slow	low	6

Source: U. S. Soil Conservation Service 1966.

^a Data in parentheses apply to the Yolo loam overburden, where it is present.

^b A = high infiltration; low runoff
D = very slow infiltration; high runoff

^c Based on AASHTO system: 1 = high; 7 = low

^d VP = very poor; P = poor; F = fair; G = good; VG = very good.

Resource Management Issues

- o Are there adequate plans for a major earthquake event in terms of stabilizing geologic conditions and providing emergency rescue and medical care?
- o Can the Stanley Boulevard cutslope be effectively stabilized to protect the roadway?
- o Can the Arroyo Del Valle Levee's north face be effectively stabilized?
- o Can the productive soils in the south-central area of the recreation area be managed to produce a native vegetation resource?
- o Can effective land use mechanisms be implemented to control erosion above the southern bank of the Arroyo Del Valle?
- o Which agency/entity should have responsibility for maintaining the southern slope along Stanley Boulevard?

Biological Resources

Introduction

This section describes Shadow Cliffs vegetation and wildlife by habitat type beginning with the aquatic/open water habitat which is most prevalent at the recreation area, and concluding with the freshwater marsh habitat which is least prevalent. Species lists are included as appendices. Appendix A lists plant species, Appendix B lists wildlife species, and Appendix C lists fish species. Appendix D is a special status species list.

Habitat Types

Shadow Cliffs supports a mosaic of six different habitat types: open water-aquatic, disturbed uplands, riparian woodland, oak woodland-grassland, urban landscape, and freshwater marsh (Figure 2-29). Most of the recreation area was greatly disturbed by past mining. The habitats support vegetation in the early stages of postdisturbance succession.

The native riparian woodland, freshwater marsh, and oak woodland-grassland communities are limited to the Arroyo Del Valle channel, and the terrace south of the arroyo in areas that were not significantly disturbed by past surface mining (Figure 2-29). Lowland portions of the study area north of Arroyo Del Valle that are seasonally or perennially inundated have younger, early-successional freshwater marsh and riparian woodland vegetation. The open water-aquatic habitat is associated with man-made pits within and adjacent to the Arroyo Del Valle channel. Disturbed uplands are associated with sites previously affected by surface mining that are not flooded during the winter months.

Shadow Cliffs is botanically interesting because of its lush and diverse riparian vegetation, and because a large number of unexpected native and nonnative herbaceous species are present (Knight, personal communication 1987). Shadow Cliffs is also notable as an example of recovery from the habitat disturbance associated with open pit mining.

Open Water-Aquatic Habitat. Approximately 105.6 acres of the recreation area is open water-aquatic habitat. The large year-round ponds along Arroyo Del Valle and at the main swimming area provide important wildlife habitats. The ponds outside of the Arroyo Del Valle channel were pit mines; within the channel, the ponds were created to augment water needs of the mines.

Open Water-Aquatic Vegetation. Three species of water-milfoil occur in the lake and arroyo. Other emergent vegetation

such as pond weed, horned pond weed, and bladder wort may occur in the open water.

Open Water-Aquatic Wildlife. The open water for the main swimming area and in the ponds of Arroyo Del Valle attract a variety of bird species such as pied-billed and eared grebes, double-crested cormorants, lesser scaup, ruddy ducks, American coots, and numerous gulls and terns. These species raft in the open water and forage for fish, aquatic invertebrates, and submerged vegetation.

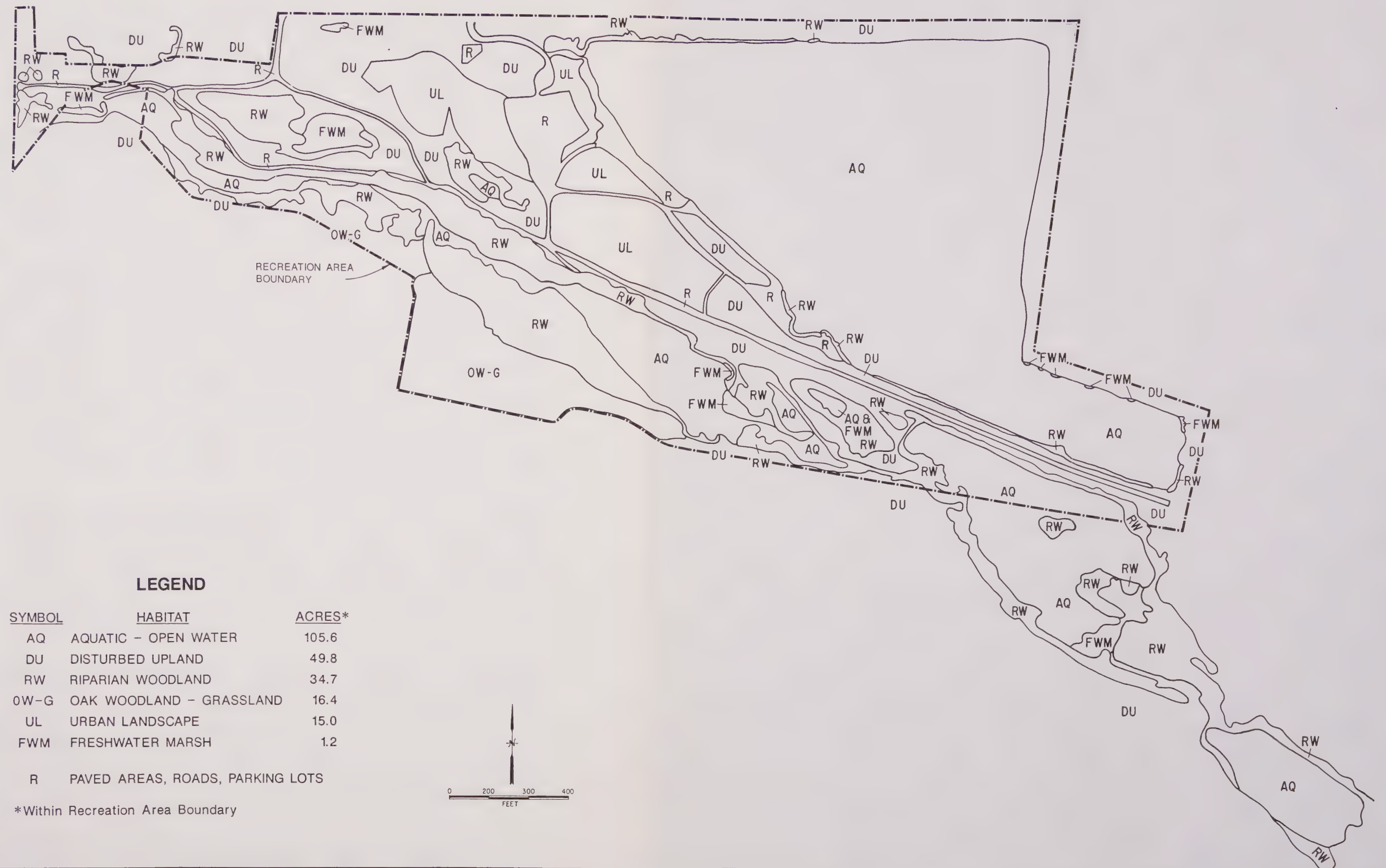
Fisheries. The lake and the arroyo contain several fish species. Shadow Cliffs Lake averages 40 feet deep with a maximum depth of 55 feet. The shallow-water shoreline region (littoral zone), which provides an important habitat for reservoir fish production, is limited because of the steep banks caused by past mining activities.

Fishing is popular year-round and accounts for about 20 percent of annual use at the park. Trout fishing at Shadow Cliffs Lake is managed as a "catchable" trout fishery. Shadow Cliffs Lake is regularly stocked with catchable-sized (i.e., two to three fish per pound) rainbow trout. Fishing success is generally related to the frequency and number of trout stocked. Natural reproduction does not occur in lakes. Typically, planted trout are rapidly caught and only a very small percentage survive from year to year (Butler and Borgensen, 1965).

Channel catfish are stocked during the summer when warm surface waters preclude stocking trout. Adult channel catfish are stocked during the summer and, unlike planted trout, exhibit a fairly high survival rate (McGinnis, 1985). Reproduction is limited because of the lack of suitable spawning habitat. Channel catfish require dark, secluded areas for laying eggs. Nests are typically constructed under rocks, in cavities or in burrows (Davis, 1959; Pflieger, 1975). At least 20 percent of the reservoir surface area should consist of littoral zone habitat less than 5 m deep to provide adequate habitat for fry and juvenile rearing, and feeding areas for catfish (McMahon and Terrell, 1982). Natural reproduction of most warm water fish in Shadow Cliffs Lake is minimal because of factors which may include the lack of shallow shoreline waters (littoral zone). This problem is further compounded by the presence of a swimming area which occupies a portion of the littoral zone. Efforts have been made to keep the swimming area free of aquatic vegetation, but have not been successful.

Redear sunfish were initially planted several years ago in an attempt to control the snail host of the parasitic trematode. Other fish known to occur in Shadow Cliffs Lake are listed in Appendix C.

The section of the Arroyo Del Valle within the park boundaries is characterized by tall cottonwoods which dominate the

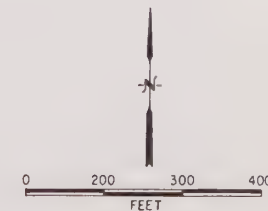


LEGEND

SYMBOL	HABITAT	ACRES*
AQ	AQUATIC - OPEN WATER	105.6
DU	DISTURBED UPLAND	49.8
RW	RIPARIAN WOODLAND	34.7
OW-G	OAK WOODLAND - GRASSLAND	16.4
UL	URBAN LANDSCAPE	15.0
FWM	FRESHWATER MARSH	1.2

R PAVED AREAS, ROADS, PARKING LOTS

*Within Recreation Area Boundary



HABITAT TYPES

FIGURE 2-29.

streambank and provide both overhead cover (shade) and food, in the form of terrestrial insects, for stream fish. The ponded areas of Arroyo Del Valle contain a variety of fish, including Largemouth bass, Bluegill, and White catfish. Fishing is allowed in the Arroyo Del Valle within the park boundary and is popular throughout the year.

Disturbed Uplands. Approximately 49.8 acres of the recreation area is disturbed upland habitat. Disturbed uplands occur along both sides of the levee and throughout the remaining upland portions of the study area north of the levee. Upland portions of the recreation area support a vegetation typical of heavily disturbed or degraded sites. This pioneer vegetation is in the early stages of postdisturbance succession. The vegetation is predominantly nonnative.

Disturbed Upland Vegetation. The disturbed uplands support only a few willow and blue oak trees. The native coyote brush forms a low overstory less than 10 feet tall and covers about 10 to 60 percent of the disturbed upland area. Various nonnative herbaceous species including poison-hemlock, milk thistle, and sweet fennel contribute to the structural diversity of this community by forming dense patches 3-6 feet tall. The ground level herbaceous layer varies from sparse to dense, and is predominantly introduced species such as soft chess, foxtail barley, filaree, geranium, sweet clover, tower mustard, horseweed, yellow-star thistle, groundsel, and horehound. Native species such as valley sky lupine, California poppy, and gumweed are intermixed.

Disturbed Uplands Wildlife. The disturbed uplands support numerous bird species such as killdeer, mourning doves, American crows, northern mockingbirds, brown towhees, and wrentits. Black-tailed hares, desert cottontails, California ground squirrels, pocket gophers, and a variety of mice and voles also take cover and forage in these habitats. An additional 26.3 acres consist of roads and paved and unpaved parking areas. These areas are not useful as habitats.

Riparian Woodland Habitat. Approximately 34.7 acres of the recreation area is riparian woodland habitat. Riparian woodlands occur along the Arroyo Del Valle channel, and at other low-lying sites north of the creek and levee (Figure 2-29). Narrow bands of riparian vegetation occur along the edges of Arroyo Del Valle, around the several ponded areas along the creek (e.g. Arroyo Pond and Island Pond), around Heron Pond, and scattered around the shore of the swimming lake. Riparian woodlands also occur at the edge of Remillard Marsh and to the west in adjacent low-lying areas.

Riparian Woodland Vegetation. Early- and mid-successional stands of cottonwood and willow riparian woodland occur along the Arroyo Del Valle. The mid-successional stand occurs along Arroyo Del Valle in the central portion of

the study area. The tall cottonwood overstory is 60 or more feet tall with trees averaging 1-2 feet in diameter at breast height and a midstory consisting of younger cottonwoods, Gooddings willow, and arroyo willow. The understory consists of sand bar willow, other shrubby willow species, mule fat, with dense, impenetrable thickets of Himalaya berry, and California grape throughout. The herbaceous layer is poorly developed due to the shade from the upper vegetation layers. Herbs are present primarily on sites with overstory openings (e.g., at the water's edge and along trails). Common herbs observed during the field survey include mugwort, umbrella sedge, curly dock, selfheal, willow herb, cocklebur, cudweed, pacific rush, and common plaintain. Cattails and tules are occasionally interspersed in this vegetation, and in marshes at the edge of the ponds and along the Arroyo.

At the south edge of the mid-successional stand is a low terrace with a dense stand of coyote brush. This site is transitional between the oak woodland and the riparian woodland in its location and resembles disturbed upland habitat.

Young, early successional, riparian woodlands occur elsewhere within the Arroyo Del Valle channel and north of the levee around Remillard Marsh. The riparian woodland at these sites has a mixed cottonwood-willow overstory about 30-40 feet tall with trees averaging less than 8-12 inches in diameter at breast height. Understory layers are composed of willow species, including mule fat and Himalaya berry. The herb layer consists of the same species as are listed above for the mid-successional riparian woodland.

Riparian Woodland Wildlife. The riparian corridor along Arroyo Del Valle supports the largest and most diverse wildlife populations at Shadow Cliffs. Ample food from Himalaya berries, wild grapes, aquatic and terrestrial insects, as well as water, cover, and shade, attract a variety of breeding birds to this streamside habitat. Nesting species include red-shouldered and Cooper's hawks, California quail, downy woodpeckers, Anna's hummingbirds, black phoebes, scrub jays, Bewick's wrens, warbling vireos, rufous-sided towhees, American goldfinches, and several species of warblers. Double-crested cormorants and great blue herons roost in the tall cottonwoods on the island in the eastern pond of the Arroyo area. Migrant birds in spring and fall would also find food and cover in this dense vegetation.

Opossums, raccoons, striped skunks, and mule deer probably use the riparian habitat for cover and foraging, especially during the summer. Mammalian inhabitants include shrews, bats, woodrats, and harvest mice in addition to the small mammals of the oak woodland-grassland. Arroyo Del Valle provides potential breeding sites for western toads, bullfrogs, and Pacific treefrogs, all of which are preyed upon by garter snakes.

Urban Landscape Habitat. Approximately 15 acres of the recreation area is urban landscaping. Landscaped areas are concentrated around the main swimming lake and parking area.

Urban Landscape Vegetation. Landscaping includes hedgerows of shrubs, scattered or grouped trees, and open grassy fields. Many of the tree species used in the landscape are California natives; the willows and cottonwoods are transplanted from elsewhere in the recreation area. The herbaceous layer consists of a mowed lawn. Landscape vegetation is included in Appendix A.

Urban Landscape Wildlife. Developed portions of the Shadow Cliffs site are less valuable to wildlife than adjacent undisturbed habitats due to the increased probability of human disturbance and the lack of food and cover. Ornamental trees and shrubs do attract certain wildlife species such as northern mockingbirds, house sparrows, European starlings, American robins, opossums, and raccoons. Lawn areas attract coots, feral ducks, and other bird species that have become accustomed to human activity.

Oak Woodland-Grassland Habitat. Approximately 16.4 acres of the recreation area is Oak Woodlands grassland habitat. This association is restricted to the south-central portion of the study area (Figure 2-29) where it occurs on a terrace about 60 feet above the floodplain of the Arroyo Del Valle. Grazing has occurred on the flat portion of the terrace but was terminated several years ago. The steep north-facing slope of this community has not been graded; it is dissected by deep gullies with headwall cuts that are actively eroding (migrating) southward into the flat terrace.

Oak Woodland-Grassland Vegetation. This association is divided into two subtypes, the treeless grassland on top of the terrace, and the wooded slopes at the north edge of the terrace.

The treeless grassland is dominated by introduced species. Italian rye is the most common species, with lesser amounts of foxtail barley, soft chess, wild mustard, and curly dock.

The wooded portion extends from the upper terrace edge down to the toe of a steep north-facing slope where it abuts the floodplain. Blue oak is the predominant overstory species. A few western sycamore, elderberry, and almond are also present. The wooded slope does not have a shrub understory. The herbaceous layer is dominated by annual grasses including soft chess, foxtail barley, and wild oats. Various annual and perennial forbs are also present such as sanicle, yarrow, wild pea, and miners lettuce. At the floodplain edge, a dense coyote brush scrub is present and resembles the disturbed upland habitat described below.

Two perennial bunchgrass species of special interest, wild rye and needlegrass, occur on the north-facing slope in canopy openings. The presence of these rarely encountered species may be attributable to an absence of livestock grazing and/or the protected nature of the north-facing slope.

Needlegrass grasslands are believed to have been one of the dominant California grassland communities prior to European settlement but are relatively uncommon today. The California Department of Fish and Game's Natural Diversity Data Base (NDDDB) considers this an important natural community and monitors the number and condition of known occurrences because of its rarity and historic importance (Holland, 1986).

Oak Woodland-Grassland Wildlife. The treeless grasslands at the tops of the terraces are important foraging habitat for many species including red-tailed hawks, American kestrels, killdeer, common barn-owls, and northern flickers. A few species like western meadowlarks and horned larks probably nest there. In the fall and winter these nesting species are joined by lark sparrows, savannah sparrows, and water pipits which forage for insects and seeds on the ground. In spring, the grassland insects attract western kingbirds, tree swallows, cliff swallows, and barn swallows.

The grasslands are important foraging habitat for raptors because they support populations of mammals such as deer mice, voles, pocket gophers, California ground squirrels, and black-tailed hares. Western fence lizards occur at this site, and common kingsnakes, gopher snakes, and western rattlesnakes are probably also present.

The blue oak woodlands within the grassland offer shade, shelter, and nesting materials for many wildlife species. Woodpeckers excavate nest-holes in live and dead oaks, and these cavities are subsequently used by other hole-nesting species like American kestrels, white-breasted nuthatches, and western bluebirds. Acorns are an important food for many species such as acorn woodpeckers, northern flickers, and scrub jays; oak foliage and bark insects attract birds like ash-throated flycatchers, western wood-pewees, bushtits, Bewick's wrens, lesser goldfinches, and a variety of warblers and vireos.

Mammals and reptiles inhabiting the oak woodland would be the same as those described for the annual grassland.

Freshwater Marsh Habitat. Approximately 1.2 acres of the recreation area are freshwater marsh habitat. A freshwater marsh association occurs along the edges of Arroyo Del Valle and at two low-lying sites (Remillard Marsh and a small unnamed marsh) north of the levee that separates the creek from the rest of the study area (Figure 2-29). Freshwater marshes develop in areas having flooded or saturated soils for most or all of the year.

Freshwater Marsh Vegetation. Freshwater marsh vegetation is characterized by emergent aquatic plants including narrow-leaved cattail, bulrush, Pacific rush, and umbrella sedge. Various introduced weedy grasses and forbs can be found around the edges of the marshes. Mule fat, sandbar willow, and other willow species also grow along the edges.

Freshwater Marsh Wildlife. The freshwater marshes along Arroyo Del Valle and at Heron Pond are rich and productive habitats that attract many breeding birds such as song sparrows, common yellowthroats, and red-winged blackbirds. Canada geese have nested in the marsh vegetation of Arroyo Del Valle. Breeding populations of this species in the Bay Area are probably descendants of injured wild birds that were released at the Lake Merritt National Wildlife Refuge several decades ago (Cogswell, personal communication 1987). The marshes at Shadow Cliffs also attract mallards, wood ducks, great blue herons, and green-backed herons. Bullfrogs, western toads, and Pacific treefrogs breed in the standing water, and are prey for predators like common and aquatic garter snakes.

Special-Status Plant Species

Several special-status plant and animal species occur in Alameda County. Special-status plants are defined to include:

- o California rare, threatened, or endangered species (California Department of Fish and Game, 1986);
- o Federal listed, proposed, or candidate-threatened or endangered species (50 CFR 39526-39584, September 27, 1985); and
- o California Native Plant Society rare and endangered species (Smith and York, 1984).

The NDDB record search shows that no special-status plants have been reported from the Shadow Cliffs Recreation Area (NDDB, 1986).

Special Status Wildlife Species

Special-status wildlife species are defined to include:

- o California threatened and endangered species (California Department of Fish and Game, 1983);
- o Federal listed, proposed, or candidate-threatened or endangered species (50 CFR 37958-37967, September 18, 1985); and

- o California bird species of special concern (Remsen, 1978).

A list of special-status wildlife species that could potentially occur at Shadow Cliffs appears as Appendix D. The list was compiled from data in the NDDB (1986), consultation with a local expert (Cogswell, personal communication 1987), and onsite habitat evaluation.

Two legally protected species could potentially occur at Shadow Cliffs. The California tiger salamander is known to occur less than 1 mile east of the site, and up to 12 bald eagles have been recorded roosting at the nearby San Antonio Reservoir during winter (Cogswell, personal communication 1987). Due to their wide-ranging habits and their preference for fish, bald eagles could also frequent Shadow Cliffs while foraging.

Eight bird species of special concern (Remsen, 1978) occur, or have the potential to occur, at Shadow Cliffs. Only the double-crested cormorant makes frequent use of the area; these birds forage in the lakes and roost in trees of the Arroyo. Sharp-shinned and Cooper's hawks also occur at Shadow Cliffs. Suitable foraging habitat exists at this site for five other bird species of special concern.

Resource Issues

- o Can effective trail management policies be implemented to reduce habitat disturbance?
- o Should a trail system be connected to surrounding residential areas?
- o Should preservation of important natural communities be a primary goal for recreation area management?
- o Should the program for control of noxious weeds be expanded to promote revegetation by native species?
- o Should disturbed upland habitat be revegetated with native species?
- o Should existing riparian woodland be enhanced by planting common native species?
- o Should the native bunchgrass stands be expanded?
- o Should the southern Arroyo Del Valle area be made more accessible?
- o Should the fisheries habitat in Shadow Cliffs Lake be improved by expanding the littoral zone?

- o Should additional fish species be introduced in an attempt to provide vegetation control and/or snail control (e.g., Tilapia, Grass Carp)?

Climate and Air Quality

Climate

Shadow Cliffs, in the Livermore Valley, is surrounded by the East Bay hills of the coast ranges to the west and the Diablo Range to the east and south. This mountainous terrain affects the microclimate in the Livermore Valley. In the winter, cold air moves down the hills and collects in the valleys. In the summer, air heats up on the slopes and in the valleys and channels through gaps (e.g. the Altamont Pass). Pollutants, particularly ozone, tend to collect in this valley. Winds tend to blow from the west, southwest, northeast, and northwest about 80 percent of the time and conditions tend to be calm about 20 percent of the time.

Temperature data from the Livermore climatological data station from 1950 to 1980 indicate that the mean summer temperature is around 90°F and commonly exceeds 100°F. The summer tends to be hot and dry. Precipitation data show the mean average annual rainfall is approximately 14 inches and occurs primarily in November through April (National Oceanic and Atmospheric Administration, 1985). Topographic and climatic conditions greatly influence air pollution in the area.

Air Quality

The federal Clean Air Act requires establishment of air quality standards for several pollutants (Table 2-4). Areas that are in violation are required to prepare and implement plans to achieve the standards by specified deadlines. The deadline for attaining both the ozone and carbon monoxide (CO) standards is December 31, 1987. The Bay Area air quality basin is not currently in attainment and, while the current basin air quality plan indicates expected attainment, it is doubtful that attainment will be reached by the December 1987 deadline. A new basin plan will be released in summer 1987 by the Bay Area Air Quality Management District (BAAQMD) reflecting nonattainment by the federal deadline (Lee, personal communication 1987).

The BAAQMD has a monitoring station in Livermore. Air quality violations have been recorded for ozone and total suspended particulates (Table 2-5). While CO tends to be a problem in the San Francisco Bay Area air basin (with 20 days in 1985 in violation of the 8-hour average standard of 9.0 ppm), the Livermore monitoring station has not recorded a CO violation in the last 10 years.

Table 2-4.

AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards ¹		National Standards ²		
		Concentration ³	Method ⁴	Primary ^{3,5}	Secondary ^{3,6}	Method ⁷
Oxidant ¹⁰	1 hour	0.10 ppm (200 ug/m ³)	Ultraviolet Photometry	—	—	—
Ozone	1 hour	—	—	0.12 ppm (235 ug/m ³)	Same as Primary Standard	Ethylene Chemiluminescence
Carbon Monoxide	8 hour	9.0 ppm (10 mg/m ³)	Non-Dispersive Infrared Spectroscopy (NDIR)	10 mg/m ³ (9 ppm)	Same as Primary Standards	Non-Dispersive Infrared Spectroscopy (NDIR)
	1 hour	20 ppm (23 mg/m ³)		40 mg/m ³ (35 ppm)		
Nitrogen Dioxide	Annual Average	—	Gas Phase Chemilumi- nescence	100 ug/m ³ (0.05 ppm)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 hour	0.25 ppm (470 ug/m ³)		—		
Sulfur Dioxide	Annual Average	—	Ultraviolet Fluorescence	80 ug/m ³ (0.03 ppm)	—	Pararosaniline
	24 hour	0.05 ppm (131 ug/m ³) ⁹		365 ug/m ³ (0.14 ppm)	—	
	3 hour	—		—	1300 ug/m ³ (0.5 ppm)	
	1 hour	0.25 ppm (655 ug/m ³)		—	—	
Suspended Particulate Matter (PM ₁₀)	Annual Geometric Mean	30 ug/m ³	PM ₁₀	—	—	—
	24 hour	50 ug/m ³		—	—	
Suspended Particulate Matter	Annual Geometric Mean	—	—	75 ug/m ³	60 ug/m ³	High Volume Sampling
	24 hour	—		260 ug/m ³	150 ug/m ³	

1. California standards, other than carbon monoxide, sulfur dioxide (1 hour) and particulate matter — PM₁₀, are values that are not to be equaled or exceeded. The carbon monoxide, sulfur dioxide (1 hour) and particulate matter — PM₁₀ standards are not to be exceeded.

2. National standards, other than ozone and those based on annual averages or annual geometric means, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of Hg (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent procedure which can be shown to the satisfaction of the Air Resources Board to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality

necessary, with an adequate margin of safety, to protect the public health. Each state must attain the primary standards no later than three years after that state's implementation plan is approved by the Environmental Protection Agency (EPA).

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the implementation plan is approved by the EPA.

7. Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

8. Prevailing visibility is defined as the greatest visibility which is attained or surpassed around at least half of the horizon circle, but not necessarily in continuous sectors.

9. At locations where the state standards for oxidant and/or suspended particulate matter are violated. National standards apply elsewhere.

10. Measured as ozone.

Table 2-5. Livermore Air Pollutant Summary

Station: 2131 Railroad Avenue, Livermore

Pollutant	Standard	1981	1982	1983	1984	1985
Ozone (O ₃) (Oxidant)	0.12 ppm ^{b,c}					
1 hour concentration (ppm) ^a						
Highest hourly average		0.17	0.14	0.06	0.15	0.15
Days of standard violations		2	1	8	7	4
Hours of standard violations		2	1	9	14	5
Carbon Monoxide (CO)						
1 hour concentration (ppm)	20 ppm ^{d,e}					
Highest hourly average		8	8	10.0	12.0	8.0
Days of standard violations		0	0	0	0	0
Hours of standard violations		0	0	0	0	0
8 hour concentrations (ppm)	9 ppm ^b					
Highest 8-hour average		3.8	4.8	4.4	4.3	5.3
Days of standard violations		0	0	0	0	0
Hours of standard violations		0	0	0	0	0
Nitrogen Dioxide (NO ₂)	0.25 ppm ^d					
1 hour concentrations (ppm)						
Highest hourly average		0.14	0.10	0.15	0.09	0.10
Days of standard violations		0	0	0	0	0
Hours of standard violations		0	0	0	0	0
Total Suspended Particulate (TSP) ^f	100 µg/m ³ ^g					
24 hour concentrations (µg/m ³) ^f						
Highest 24-hour average		91	90	132	115	117
Number of standard violations		0	0	1	2	4

Source:

^a ppm: parts per million.^b Federal standard.^c The California ozone standard is 0.10 ppm.^d California standard.^e The Federal carbon monoxide standard is 35 ppm.^f µg/m³: micrograms per cubic meter.^g National primary standard is >75 µg/m³.

Cultural Resources Inventory

Chapter 3

CULTURAL RESOURCE INVENTORY

Archeological Resources

The Shadow Cliffs study area is situated within the Chochenyo tribal territory of the Costanoan (Ohlone) Indians (Levy, 1978). Prehistoric archeological sites, which contain the cultural remnants of the Costanoans and their predecessors, are documented throughout the Livermore-Amador Valley. Several such resources were located adjacent to the now extant Willow Marsh (1.5 miles northwest of the park) and have been discovered under several feet of alluvial deposits. The closest of these sites is approximately 0.5 mile to the northwest of the Shadow Cliffs area and is reported to be totally destroyed.

No visible evidence of the presence of prehistoric archeological resources has been noted. This does not preclude the possibility that archeological deposits exist below the ground surface and could be encountered during land alteration activities. Despite the fact that the area has been greatly disturbed by past brick production, and sand and gravel quarrying, it is possible that deeply buried prehistoric cultural deposits are present. Some of the archeological sites associated with the prehistoric Willow Marsh and feeder drainages have been discovered below 15 to 30 feet of alluvial deposits.

Historic Resources

The historic era begins with the Spanish Period which was characterized by exploratory expeditions between 1769 and 1776 into the Costanoan territories (Levy, 1978). None of the documented expedition routes appears to have passed within the general vicinity of the study area (Beck and Haase, 1974). During the Mexican Period (1821 to 1846), secularization resulted in the division of Mission San Jose lands into individual landgrants and the study area was situated within the northwest section of Rancho Valle de San Jose (Thompson and West, 1878). During that era, Rancho Valle de San Jose consisted of 51,572.26 acres and contained several adobe structures. Three adobes were located in the general region -- the two Kottinger adobes located within Pleasanton and the Juan Bernal adobe located immediately north of Pleasanton (Hendry and Bowman, 1940). Other adobe structures were situated along the western boundary of the Rancho at considerable distance from the Shadow Cliffs area. Throughout the late nineteenth century most of the Rancho lands were subdivided. By the 1870s, Rancho Valle de San Jose had

been reduced to 500 acres in size (Thompson and West, 1878). By 1878 the study area was located within parcels owned by Juan Bernal and J. Kourman, neither property appears to have contained structures (Thompson and West, 1878).

During this period brick production began in the immediate study area and the history of these activities is well documented in the Anastasio (1986) report for the adjacent Alameda County property. The following discussions are from that report.

"To the west of the project parcel on the lands of Joseph F. Black was a large brick yard, situated on either side of Stanley Boulevard and the Central Pacific Railroad tracks (citation deleted). This brick yard is described as "...one of the largest brick-making establishments in the county, where bricks of superior quality are manufactured" (citation deleted). The history and ownership of this brick yard is unknown. The biography of Joseph F. Black makes no mention of a brick yard, nor is it mentioned in Wood's history of Pleasanton (citation deleted). In addition, no record of this early brick yard could be found at the Livermore-Amador Historical Museum....It is possible that this brick yard, which probably exploited the local alluvial clays common in the Bay Area (citation deleted), existed for only a short period around 1878.

"In 1889 another brick yard was established by Hilaire Remillard on the former Bernal parcel....Hilaire Remillard was born in Canada in 1833. In 1852 he moved to Boston and established a brick manufacturing business. Two years later, Remillard traveled to the California gold mines, where he searched for gold until 1860. He then moved to Alameda County, but soon left to prospect in Idaho Territory. After two years, Remillard returned to Alameda County, where he settled in Oakland and began to manufacture brick (citation deleted). The Remillard family continued to manufacture bricks until the 1930's; at the height of their production around the turn of the century, the Remillard family operated brick yards in Larkspur, Oakland, Pleasanton, and San Jose.

"In 1903 the Remillard brick yard in Pleasanton consisted of 2 kilns and drying houses, 24 cabins and a mess house for the workers. At the height of production, this brick yard employed as many as 200 people. The common bricks, made from the local alluvial clay quarried from Arroyo Valle, were shipped to the Remillard yard in Oakland, and then shipped elsewhere. The economic crash of 1929 brought about a drastic reduction in operations, and the majority of workers were dismissed. In 1930 a major fire almost totally destroyed the brick yard.

"At some time after the fire, the Remillards resumed quarry operations on the parcel (citation deleted). By the time Kaiser Sand and Gravel began quarrying in the area in the 1950s, the Remillard pit had been extensively quarried and the remains of the brick yard nearly demolished....It is unclear whether or not the Remillards quarried for sand and gravel as well as clay. In addition, it is not known when the Remillard quarry operations ceased. Despite lack of activity on the project property, it remained in the Remillard estate until partially purchased by Kaiser Sand and Gravel, and finally by the County of Alameda."

The Anastasio (1986) cultural resources study of the adjacent Alameda County property resulted in the recording of the Remillard Brick Yard Historical Site. Field observations verified the location and condition of this site. The site features, which include a wall fragment, a large concrete slab, a collapsed brick mound, and the remnants of a kiln, are contained within the Alameda County property. Brick rubble and associated debris was observed at Shadow Cliffs to the west and south of the Alameda County property.

Anastasio (1986) has determined that the remains of the Remillard Brick Yard have minimal integrity as they have been severely damaged and displaced by both the 1930 fire and subsequent quarrying activities. "The remnant structures offer little scientific or historic information, and almost no public or interpretive value....As such, these remnants do not appear to warrant preservation, restoration, or relocation" (Anastasio, 1986).

An additional historical feature consists of old railroad ties exposed in the cut bank along the north bank, approximately 8 meters below the present Stanley Boulevard road grade (Figure 3-1). The exposed portion of the railroad grade extends for a distance of approximately 70 meters with 10 ties and 3 rotted tie fragments visible. A single section of metal rail is also present. The Livermore-Amador Valley Historical Society in Pleasanton was consulted and Mrs. Dagmar Fulton (Society President) suggested that the railroad feature was the remnant of a railroad spur associated with the Remillard Brick Yard operation and possibly used during later quarrying activities as well.

The railroad spur does not possess sufficient historic value or uniqueness to be regarded as a historically significant resource. The railroad spur remnants in themselves will render little historical information regarding industrial activities in the area. Such information can best be extracted from historical maps and records.

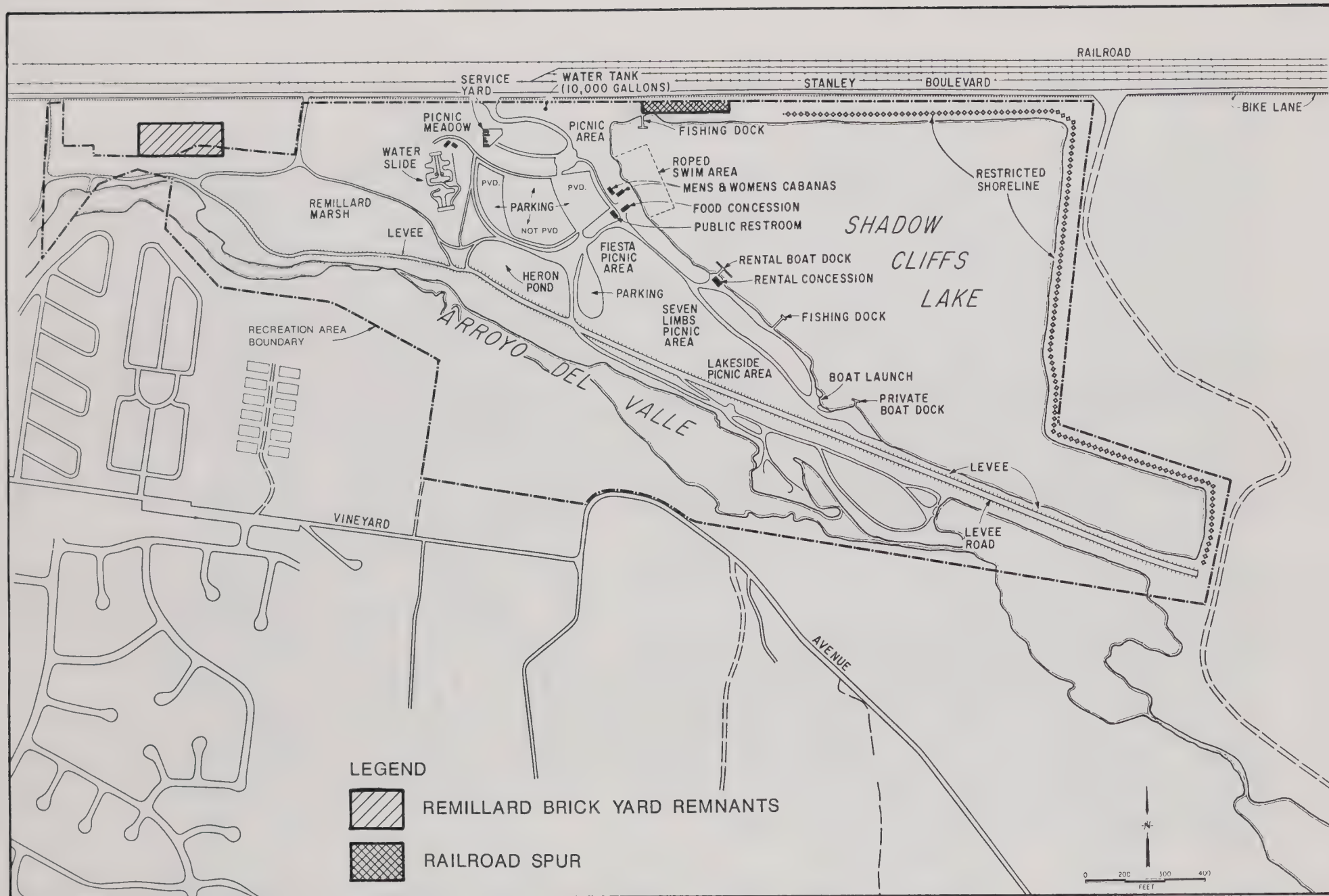


FIGURE 3-1. HISTORIC REMNANTS

Source: Modified from David Chavez & Associates 1987

Resource Issues

- o Should the identified historical remains be considered as trailside points of interest?

Manmade Resource Inventory

Chapter 4

MANMADE RESOURCE INVENTORY

Access, Circulation, and Transportation

Existing Roadways

Shadow Cliffs is located on Stanley Boulevard and is accessible from U. S. Interstate 580 (I-580) via Santa Rita Road and Hopyard Road, or via First Street in Livermore. It is also accessible from U. S. Interstate 680 (I-680) via Bernal Avenue and Sunol Boulevard.

Figure 4-1 shows existing average daily traffic (ADT) volumes in the vicinity of the park. The following is a description of major roadways in the vicinity of the park.

I-580 is an eight-lane, east-west freeway with ADT ranging from 60,000 to 70,000 near Livermore and from 90,000 to 110,000 near Pleasanton (Caltrans, 1985).

I-680 is a four-lane, north-south freeway with ADTs ranging from 50,000 to 60,000 near Pleasanton (Caltrans, 1985). I-680 tends to be congested during peak hours. Programmed improvements for Alameda County include widening this freeway from four to six lanes from I-580 to Route 238 in Fremont (Alameda County Planning Department, 1986).

Stanley Boulevard is a four-lane undivided roadway from the western edge of the recreation area to Livermore, and is being expanded from two to four lanes from Shadow Cliffs to Pleasanton. Existing weekday ADT is about 18,000 in the vicinity of Shadow Cliffs (Preston, personal communication 1987). Weekend daily traffic was estimated to be 10,500 in 1980. Weekend traffic can be assumed to have increased since 1980 because the number of visitors at the park has increased, the water slide has been added and Stanley Boulevard's capacity has increased from two to four lanes. At Shadow Cliffs, Stanley Boulevard is signalized with a separate westbound left turn lane, a median and an eastbound right turn lane. An existing bikeway fronts Stanley Boulevard, connecting Livermore and Pleasanton, providing convenient access to Shadow Cliffs.

Santa Rita Road, connecting I-580 and Stanley Boulevard in Pleasanton, has a north-south orientation. It has six lanes between I-580 and Valley Avenue and four lanes between Valley Avenue and Stanley Boulevard. Existing ADT ranges from 21,000



Source: Caltrans 1985, Jost pers. comm., Van Epps pers. comm.

to 27,000 and is generally free-flowing (Jost, personal communication 1987).

Hopyard Road, an alternate connection between Stanley Boulevard and I-580, has a north-south orientation. While it is a heavily traveled route in Pleasanton, with ADTs ranging from 18,000 to 39,000, it does not provide the most direct access to Shadow Cliffs (Jost, personal communication 1987).

Bernal Avenue is a four-lane east-west roadway connecting I-680 to Stanley Boulevard via First Street for points to the north of Pleasanton. During April to October 1987, Bernal Avenue will be extended from Main Street to First Street, and a signal will be installed at Bernal Avenue and First Street. Existing traffic is generally freeflowing with existing ADT ranging from 22,000 near I-680 to 8,500 near First Street (Jost, personal communication 1987).

Sunol Boulevard is a two-lane north-south roadway connecting I-680 and Stanley Boulevard via First Street for points to the south of Pleasanton. Existing traffic is generally freeflowing with existing ADTs ranging from 15,000 to 19,000 (Jost, personal communication 1987).

Valley Avenue is planned for an improvement and extension between Santa Rita Road and Stanley Boulevard in the Fall of 1988. This extension will provide more direct access to Shadow Cliffs for visitors currently using the Santa Rita to Stanley route. A signal is to be added at Santa Rita Road and Valley Avenue. The new route is to be widened to four lanes along the existing Valley Avenue between Santa Rita Road and City Street and extended to Stanley parallel to the Southern Pacific Transportation Company right-of-way (Jost, personal communication 1987).

State Route 84, or 1st Street, in Livermore is an east-west roadway connecting I-580 to Stanley Boulevard from the east. It has two lanes from I-580 to the Western Pacific Railroad tracks and four lanes from the railroad tracks through the City of Livermore. It is considered freeflowing during the weekends and congested during weekday p.m. peak hours. Existing ADTs range from 18,000 to 24,000 (Van Epps, personal communication 1987).

Livermore Avenue connects I-580 to 1st Street in Livermore, providing access to Shadow Cliffs visitors from the east. Livermore Avenue provides an alternative to using 1st Street. It is, however, considered a less desirable route.

Parking

The Shadow Cliffs Regional Recreation Area provides about 1,000 designated parking spaces. Approximately 300 spaces are paved and 700 are unpaved. Existing parking capacity is usually

adequate. It is only exceeded approximately five times per year.

Overflow parking outside of the recreation area is available on Stanley Boulevard near the northwestern corner of the recreation area and can accommodate approximately 20 cars. After these spaces are taken, cars must queue up outside the park gates and wait for other park visitors to leave. Visitors may be required to pass Shadow Cliffs, turn around and queue up in the eastbound turn lane at the front gate. Drop-off visitors are not allowed to drive into the park and must leave their vehicles on Stanley Boulevard and walk in.

Internal Circulation

The entrance to Stanley Boulevard is a narrow road extending approximately 300 feet before reaching the kiosk where visitors pay to enter. Straight ahead, beyond the kiosk is a large parking area. The circulation system is shown in Figure 4-2.

Internal circulation problems occur because the park entrance was designed for a smaller capacity than current use. The entrance area is too narrow for the volume of cars trying to enter Shadow Cliffs during peak periods, leading to queues on Stanley Boulevard. The narrow entrance roads also cause problems for buses and trucks, which have hit the kiosk and run over the lawn. Pedestrians walking into the park and from the beach to the waterslide cause further congestion for vehicles entering and exiting the park.

Pedestrians walking between the beach and waterslide often conflict with vehicles trying to park and enter and exit the park. Except for peak periods, Shadow Cliffs' personnel avoid using the overflow parking lot where this foot traffic usually conflicts with vehicular traffic.

Internal circulation can be confusing, particularly in the unpaved parking areas. In order to maintain an orderly and efficient parking pattern, park personnel are required to monitor the parking lots for about 4 hours every weekend or holiday. The placement of boats and trailers in the parking lot poses a potential internal circulation problem. No specific area is currently designated for boats and trailers.

Park-related traffic faces increasingly hazardous conditions while crossing Stanley Boulevard. The increasing residential development near the park and growing number of user days in the park causes an increase in traffic on Stanley Boulevard. As traffic increases, visitors entering and exiting the park face increasing traffic hazards.

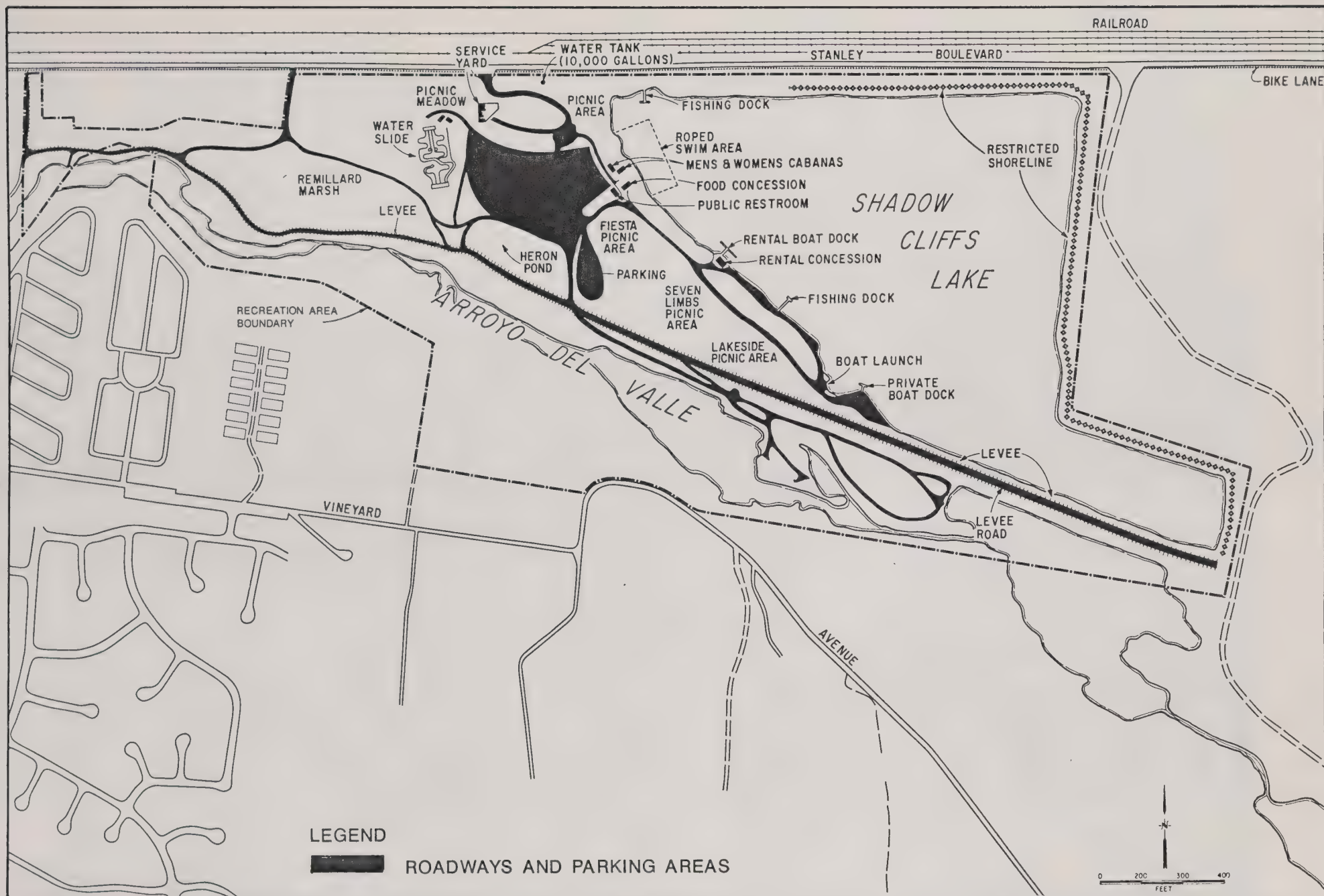


FIGURE 4-2. CIRCULATION SYSTEM

Resource Issues

- o Should additional paved parking areas be provided?
- o Can the internal circulation patterns be made more efficient?
- o Should the park entrance be improved to alleviate congestion during peak use periods?
- o Should designated boat and trailer parking areas be provided?

Recreational Facilities and Usage

Shadow Cliffs has a number of developed recreation features including: Shadow Cliffs Lake, turfed picnic areas, the Arroyo Del Valle, Heron Pond, Remillard Marsh, and the Rapids Water-slide concession. All patrons must pay an entrance fee for parking and any other applicable fees such as boat launching and fishing.

The recreation features are connected by a system of paved and unpaved paths and trails used by bicyclists, joggers, hikers, and fishermen. The EBRPD also intends to link Shadow Cliffs with the proposed Amador Valley Regional Trail System. This system will eventually connect many of the EBRPD parks in the Amador Valley (East Bay Regional Park District, 1986a). The Recreation Area facilities are shown in Figure 4-3.

Shadow Cliffs Lake

The eastern portion of the 249-acre recreation area is dominated by a 90-acre lake within depressions formed by past quarry operations. Water supply for this lake comes from groundwater, precipitation runoff, and discharges from surrounding quarry operations.

The lake area provides opportunities for a variety of recreation experiences including swimming, wading, sunning, boating, picnicking, fishing, and windsurfing. Facilities for these activities include: a beach and swimming area with food concessions and dressing rooms; a boat dock for private and rental boats; fishing docks; a launch area; and storage facilities.

Swimming Facilities. The beach and swimming area is located in the northwestern corner of the lake and is comprised of approximately 400 shoreline feet of sandy area adjacent to a 2-acre roped swimming and wading area. Swimming and wading are permitted year-round, but are restricted to this designated swimming area unless special arrangements are made with park management. The swimming area has a floating platform and lifeguard towers which are staffed during the designated summer swim season (usually May to September).

A significant problem that may confront swimmers and waders is the periodic presence of a small trematode worm that causes schistosome dermatitis, commonly known as swimmers' itch. As a result of this problem, the lake was closed to swimming and wading for 7 days during 1986. EBRPD is attempting new control methods for 1987 (see "Biological Resources" section for full discussion).

A food concession, dressing rooms, and restroom facilities, are located adjacent to the beach. The food concession consists

of a 900-square-foot structure that houses a kitchen, fishing tackle supply area, and a concession office. Dressing room facilities consist of men's and women's cabanas including changing areas, portable chemical toilets, and storage. The men's cabana also has a lifeguard locker room. An additional public restroom building is located immediately west of the food concession.

Boating Facilities. Boating facilities are located south of the food concession/dressing complex, and include a boat rental concession and dock, a dock for private boats, and a boat launch area (see Figure 4-3). The boat rental concession provides electric powered fishing boats, rowboats, and paddle boats. There are 30 rowboats and electric boats and approximately 10-15 paddle boats available. The concession also provides storage spaces for windsurfing boards.

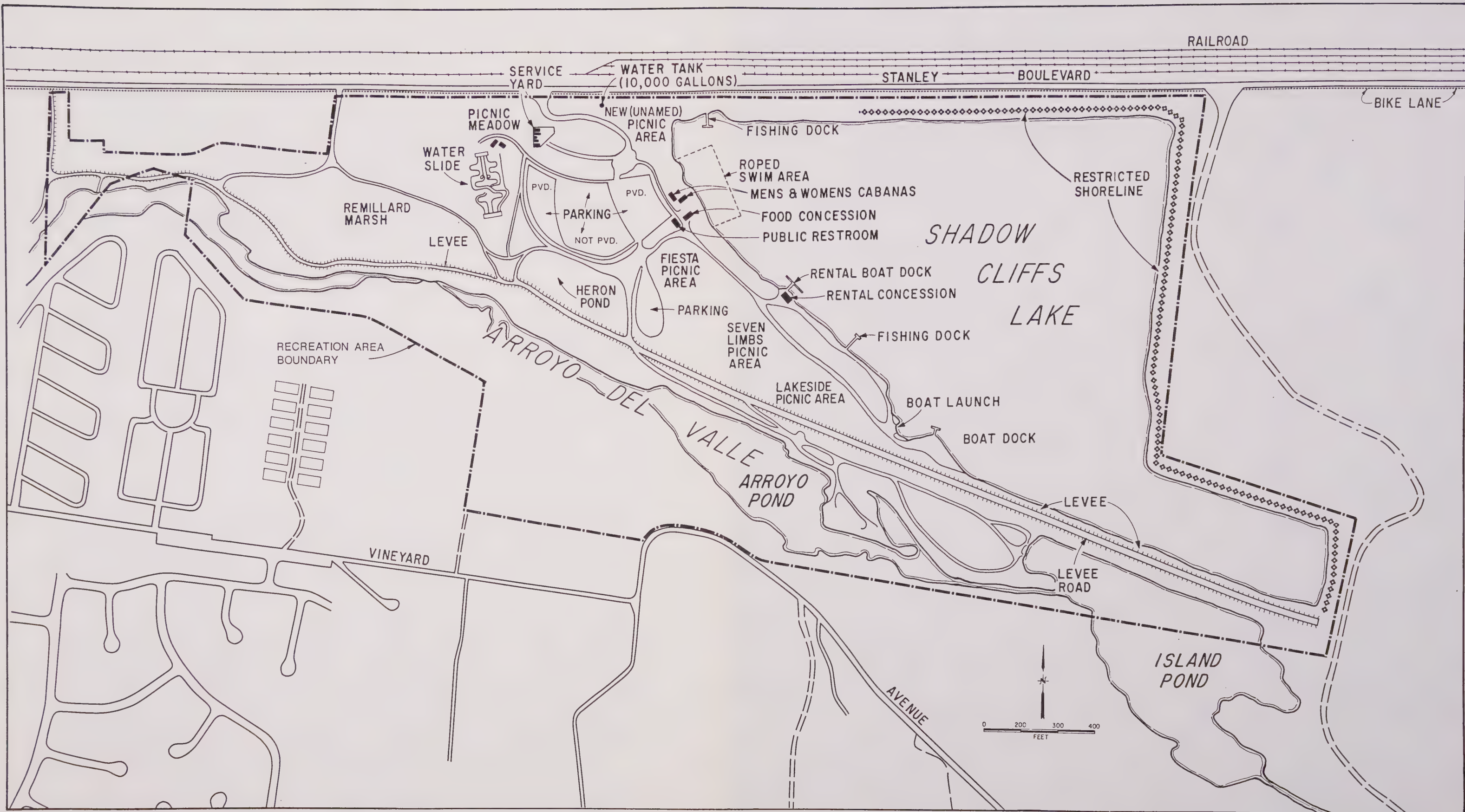
Fishing Facilities. There are two fishing docks located south of the beach area concessions (Figure 4-3). Limited shoreline fishing access to the southeastern portion of the lake is provided by a trail located along the southern levee. Fishermen traverse the lakeside of the levee on footpaths to several shoreline fishing locations. Access to the entire eastern shoreline and the eastern half of the northern shoreline is restricted due to steep and unstable slopes (see "Geology and Soils, Chapter 2).

Arroyo Del Valle

The portion of the Arroyo Del Valle within Shadow Cliffs' boundaries is situated generally at the southern border of the property and is separated from the most extensively developed and used areas of the park by the major access levee which runs east to west across the property south of the lake, picnic areas and waterslide. Activity in this relatively undeveloped portion of the park consists primarily of passive recreation such as fishing, hiking, jogging, bicycling, nature interpretation, and picnicking. Swimming is prohibited in this waterway. Picnic tables are provided in some Arroyo areas.

Fishing also occurs in the Arroyo Del Valle. Boating is not permitted. The main Arroyo ponds are clearly marked with signs restricting swimming and boating activities.

This area of the park receives relatively low amounts of use even during peak summer days. The undisturbed and relatively quiet nature of this area provides a unique opportunity for birdwatching and other nature interpretation activities.



SHADOW CLIFFS REGIONAL RECREATION AREA FACILITIES

FIGURE 4-3.

Picnic Areas

There are three designated picnic areas located south of the parking area and immediately adjacent to the southwest shoreline of Shadow Lake. The Seven Limbs, Fiesta, and Lakeside picnic areas together constitute approximately 5 acres of turfed open space featuring barbecue pits, picnic tables, and paths to both the lake and parking area (Figure 4-2).

The park staff is currently in the process of developing an additional group area with picnic tables and barbecue pits northwest of the beach in the vicinity of the old boat launching area (Figure 4-2). Picnic areas are also maintained west of the waterslide concession, in the beach area, and in Arroyo Del Valle.

Other Areas

Heron Pond provides recreation including nature interpretation with good opportunities for birdwatching and observation of natural succession within a gravel quarry.

Remillard Marsh is also a good example of natural succession at a gravel pit. Uses in this area are limited to passive recreation such as birdwatching and nature interpretation.

Waterslide

Constructed in 1981, the Rapids Waterslide, operated by Heritage Investment Company, is located west of an earthen levee which separates the developed eastern portion of the park from the relatively undeveloped western park (Figure 4-3). The levee has been opened in the vicinity of the waterslide to provide a paved path from the parking area to the facility entrance.

The 10-acre waterslide area generally comprises the main waterslide flumes and surrounding berms, an office/ticket booth, a dressing facility, and a picnic meadow. The slide consists of four smooth fiberglass flumes positioned on a large earthen mound approximately 46 feet high by 300 feet long, and 150 feet wide (East Bay Regional Park District, 1980a). Additional berms are located on the north, west, and east sides, forming a bowl-shaped mound with the slides facing north toward Stanley Boulevard (Figure 4-4). Waterslide users travel from the bottom of the mound near the landing pools, up a path to the take-off area, and use rubber pads to slide down a stream of water.

The concession office/ticket booth is located immediately southeast of the landing pools where patrons can purchase hourly or full-day tickets. The dressing facility consists of men's and women's dressing areas with low-flow flush toilets. Clothes lockers, a public telephone, and bicycle racks are located outside this building.

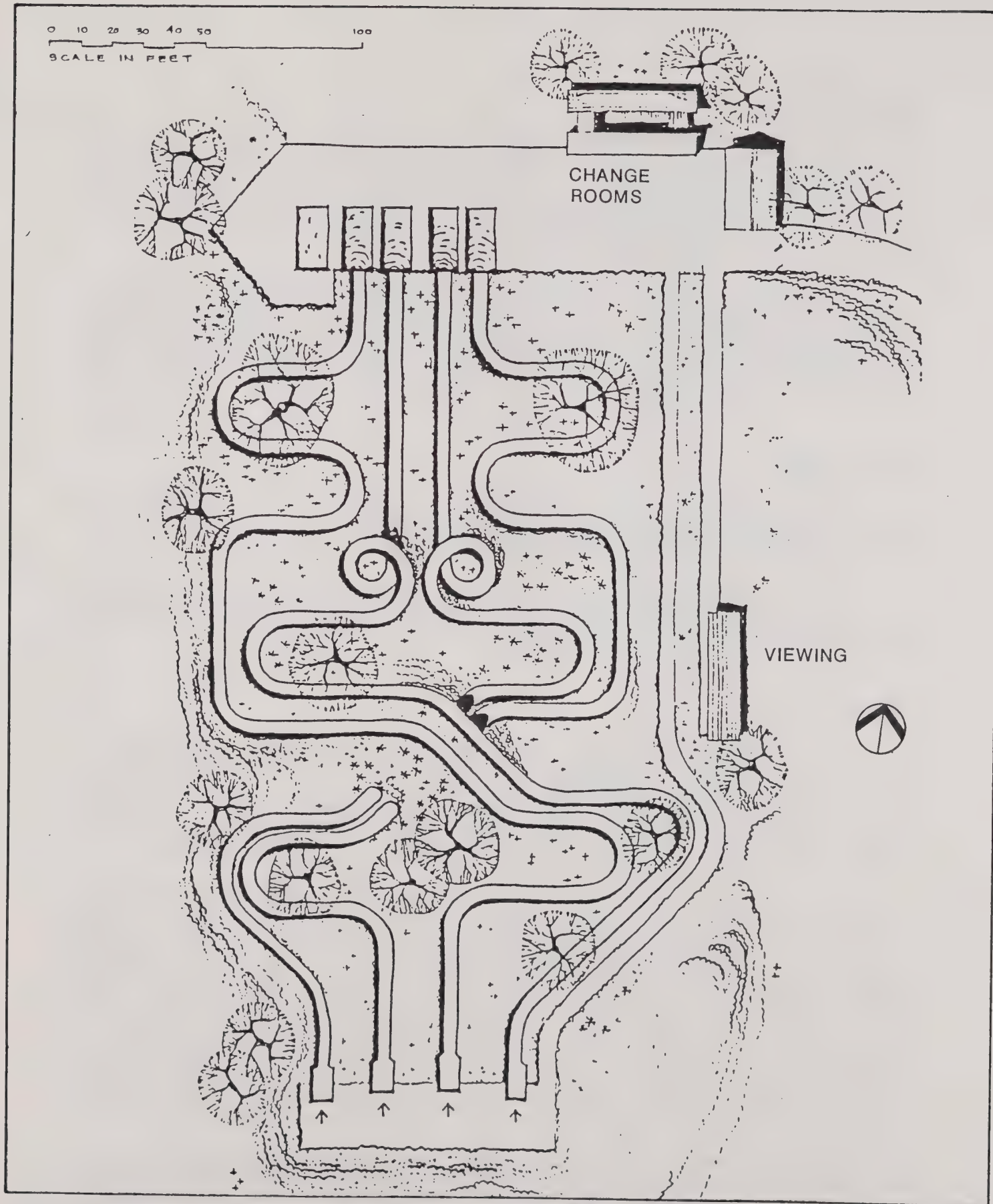


FIGURE 4-4. WATER SLIDE FACILITIES

Source: East Bay Regional Park District 1980

The waterslide system includes a large 27,000-gallon holding pond for splash-over water and waterslide cleaning. The waterslide receives its water supply from the park's well, located in the service yard. (East Bay Regional Park District, 1980a.)

As part of the waterslide facility, the concessionaire developed a picnic meadow outside the gates to the northwest. This open space includes barbecue pits and picnic tables and provides a clear view of the waterslide. EBRPD staff at Shadow Cliffs report substantial burrowing by ground squirrels in the area and at the waterslide itself.

Park Use

Shadow Cliffs is one of EBRPD's most heavily used parks. Use and attendance at Shadow Cliffs varies according to the season. During the summer months, use of the park is dominated by recreationists utilizing facilities at Shadow Cliffs Lake and the waterslide (Figure 4-5).

General park use (picnic, beach, and lake use only) amounted to approximately 500,000 recreationists in 1986, while the waterslide concession drew an additional 75,000 users. During peak holiday weekends in 1986, combined recreational activity at the park had reached 15,000 users. A 1981 survey of monthly user data indicates that well over 90 percent of the recreation use at Shadow Cliffs occurs between April and October. In 1986 this was also the general use pattern for the park.

Heavy use during peak summertime weekends can overtax the park's facilities. Overcrowding and waiting lines are a common occurrence at all of the park's major attractions.

Resource Issues

- o Should swimming areas be expanded to alleviate crowding and increase swimming opportunity?
- o Should fishery habitat be enhanced and fishing areas expanded?
- o Should lake banks be stabilized to allow expansion of fishing access trails?
- o Should food and restroom facilities be expanded to reduce overcrowding during summer months?
- o Should waterslide facilities be expanded?
- o Will continued presence of ground squirrels jeopardize the physical integrity of the waterslide facilities?

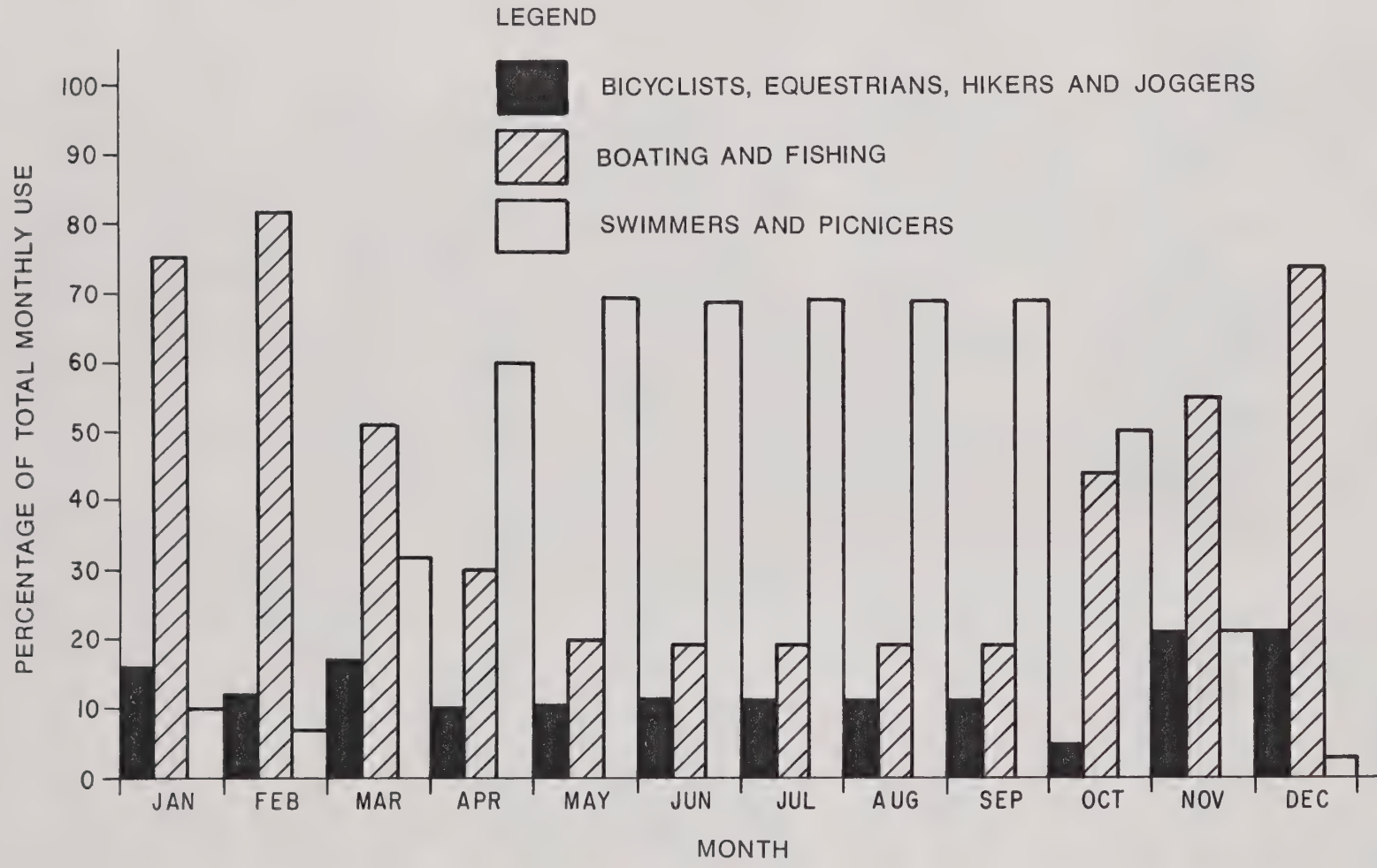


FIGURE 4-5. MONTHLY USE (1981)

Service Facilities and Utilities

Police Protection

First response police protection services at Shadow Cliffs are provided by the EBRPD Safety Department with support services provided by several other government agencies. The EBRPD maintains a patrol for regional parks in the district. A public safety substation is located at Shadow Cliffs. The substation is located in the service yard near the main office, and is responsible for servicing Shadow Cliffs and other parks located in the southern portion of the district.

The City of Pleasanton Police Department is capable of providing a 2-minute emergency response time to Shadow Cliffs (East Bay Regional Park District, 1980a).

The Alameda County Sheriffs' Department has formal jurisdiction over all unincorporated areas within the county, including Shadow Cliffs. Response times for sheriff patrols are generally longer than those of municipal police departments, because of the large county areas and less frequent patrols provided by sheriff's departments.

The California Highway Patrol (CHP) currently operates a patrol on I-580. The response time from this beat is less than 5 minutes (Hall, personal communication 1987).

Major law enforcement problems at Shadow Cliffs involve use of drugs and alcohol, fights, and thefts. Trespassing and illegal entry of the park are also problems on peak summer weekends. Illegal entry of the park generally occurs south of the park at Vineyard Avenue, and entails trespassing on private property.

Fire Protection

Fire protection services are provided by four agencies in the general vicinity of Shadow Cliffs. The EBRPD maintains a fire fighting unit responsible for fire protection on regional parklands and other properties through mutual assistance agreements with Alameda County, California Department of Forestry, and the City of Pleasanton.

Initial response to a fire at Shadow Cliffs could be provided by the Alameda County Fire Patrol in Livermore, with a response time of about 4 minutes, or from the City of Pleasanton Fire Department. The primary fire protection services would be provided by the EBRPD from its station at Del Valle Regional Park or from the Cull Canyon Regional Recreation area. Wildland fire response would be from the California Department of Forestry from the Sunol Station.

In 1988, the EBRPD will provide fire fighting equipment at Shadow Cliffs. A fully equipped wildland fire truck would be stationed at the park, and existing staff would be trained for fire fighting.

Fire hazards at Shadow Cliffs are associated with the high level of use during peak summer weekends. There are no water lines in the more remote areas of the park, such as those west of the waterslide or in the Arroyo Del Valle. A fire in these areas would require water to be trucked in or pumped from existing waterways.

Water Service

The domestic water supply at Shadow Cliffs is provided by a well located in the park service yard. Water lines include a 2.5-inch main running from the well site east along the service yard entrance road to an area north of the entrance circle. This line supplies water for a 2-inch extension to the waterslide and a similar service extension to the food concession complex. The park water supply system also includes a 10,000-gallon water tank for limited domestic and irrigation purposes.

Water sources for Shadow Cliffs include groundwater, rain-water runoff, and discharges from surrounding quarry operations. A 12-inch steel pipe, carrying excess quarry water from the Kaiser quarry operation, runs south along the levee near the waterslide. This pipe discharges high quality water into the Arroyo Del Valle. A turnout is also available for Shadow Cliffs Lake.

Sewer, Wastewater, and Drainage

Sewage and wastewater collection facilities at the park include: one 6,000-gallon holding tank shared by the main park office and the waterslide; a 4,500-gallon tank which handles wastewater from the food concession and sewage from flush toilets, and 12 portable chemical toilets, each with 30-40 gallon capacities. These facilities are pumped nearly every day by a private septic tank clean-out firm. Sewage and wastewater is trucked from the park for treatment at the Pleasanton sewage plant. The current sewage disposal system is considered to be the most limiting factor to possible future park expansion. A possible solution to this limitation would be annexation to the city of Pleasanton and connection to the city's sewage collection and disposal system. The EBRPD and city staff have been discussing this issue, but have not yet reached agreement.

An issue associated with the collection of sewage from holding tanks is the effect these tanks could have on groundwater quality should the water table come in contact with

these facilities. The basis for this concern is that the closure of gravel quarry operations east of Shadow Cliffs could reduce the amount of groundwater pumping in the area, thereby allowing the aquifer to recharge and raise the water table.

There are currently no drainage facilities at Shadow Cliffs. Surface runoff drains into Shadow Cliffs Lake. In addition, a 12-inch steel pipe (running south along the levee near the waterslide), carries excess quarry water from the Kaiser quarry operation. This pipe discharges high quality water into the Arroyo Del Valle.

Solid Waste

Solid waste service for Shadow Cliffs is provided by the Pleasanton Garbage Service, a private contractor. Refuse is collected in three refuse gondolas with capacities of 4, 20, and 25 cubic yards.

Pleasanton Garbage Service hauls refuse from Shadow Cliffs to the Pleasanton Transfer Station. The garbage is then transported to the Vasco Road Landfill. This landfill has a projected lifespan to about the year 2008.

Electricity and Telephone

Electricity and telephone service is provided from lines located north of the park on Stanley Boulevard. Public telephones are provided at the food concession and waterslide.

Park Service Yard

The service yard is located northeast of the waterslide and is approximately 100 feet long by 80 feet wide. This area contains a series of portable structures including the District Manager and Park Ranger offices, a shop for equipment and vehicle maintenance, the Park Supervisor's office, an EBRPD police patrol office, and a storage building. The yard includes an employee parking area and a potable water well.

Resource Issues

- o Can measures be implemented to eliminate trespassing and illegal entry at Shadow Cliffs?
- o Should groundwater monitoring be conducted to evaluate the risk from contact of rising groundwater with sewage holding tanks?

- o What impacts to public services (including sewer, police, and fire) will result if the recreation area is annexed to the City of Pleasanton?
- o Should water lines be extended into remote areas of the park to aid in fire fighting?
- o Should Shadow Cliffs be annexed to the city of Pleasanton to provide greater sewage disposal capacity?

Ownership, Easements, and Other Legal Agreements

Title to the approximately 455 acres of real estate at Shadow Cliffs Recreation Area is held by EBRPD. The acquisition of real property for Shadow Cliffs began in 1970 and has occurred in five transactions (Figure 4-6). Easements and rights-of-way (ROW) held by others for use at Shadow Cliffs are for either access to adjacent land; construction, operation, and maintenance of public utilities; or development of the bicycle and pedestrian trail along Stanley Boulevard. The water slide facilities are owned and operated by a private concessionaire under a lease with EBRPD.

Ownership of Park Land

The initial parkland was acquired as a gift of 144 acres from Kaiser Industries Corporation by a quitclaim deed dated May 29, 1970. In the deed, Kaiser Industries Corporation reserved for itself a one-half interest in all oil and mineral rights, a 30-foot easement for maintaining water lines and pumps from its water pond north of Stanley Boulevard to an outfall in Arroyo Del Valle, with a reversionary interest if the land ceases to be used as a park.

An additional 65 acres was purchased by EBRPD from Home Savings and Loan to form the southern portion of the park. The instrument of conveyance was a grant deed dated March 29, 1974. In the deed, Home Savings and Loan reserved for itself a 100-foot right-of-way and a one-half interest in all oil and mineral rights. Other preexisting interests in this parcel include: the right to public use of Vineyard Road; a 90 percent interest in all sand and gravel held by Kaiser; an easement held by Alameda County to fill slopes for widening Vineyard Road; and easements held by utility companies for installing and maintaining water and electrical lines.

The western portion of the park was acquired by purchasing 42 acres from the estate of Lillian Dandini (the Remillard Brick Company property). The January 29, 1975 deed was encumbered by utility easements held by Pacific Gas and Electric and railroad track easements held by the Southern Pacific Railroad.

EBRPD also owns a 46-foot-wide bicycle and pedestrian trail which extends approximately 1.1 miles east of Shadow Cliffs lake along Stanley Boulevard. Land for the trail was acquired by three purchases. First, EBRPD bought by deed, dated August 22, 1972, a 2,700-foot-long segment for the trail from Lone Star Industries, Inc. Lone Star Industries reserved a ROW across the trail for vehicle and railroad access and a reversionary interest if the property is not used by EBRPD as a trail. The 1972 deed was also encumbered by easements for polelines held by Pacific Telephone and Pacific Gas and Electric.

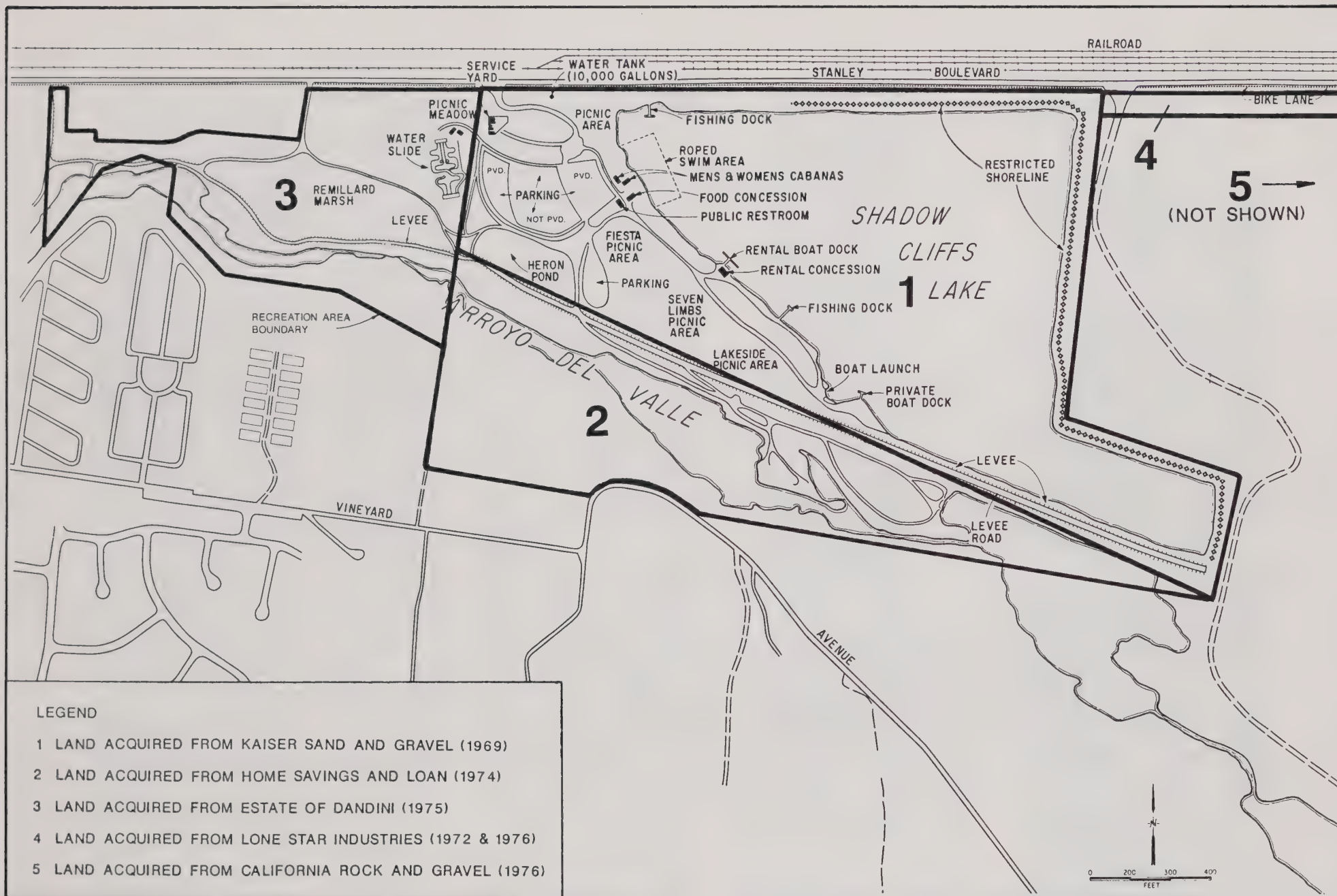


FIGURE 4-6. ACQUISITION OF REAL PROPERTY

The second purchase was also from Lone Star Industries. The July 21, 1976 grant deed conveyed an additional 2,044 feet along Stanley Boulevard immediately east of the parcel conveyed by the 1972 deed. Lone Star Industries reserved a 60-foot ROW for "Chemical Bank," a reversionary interest, and inserted two further conditions: that EBRPD would not encourage equestrian use of the trail; that EBRPD install and maintain a fence between the grantor's property and the trail, including a gate to allow Lone Star Industry access to Stanley Boulevard.

The third purchase was of a 964-foot-long strip of property from California Rock and Gravel to extend the trail farther east. The deed was recorded September 22, 1976. California Rock and Gravel reserved a reversionary interest and included the condition that equestrian use of the trail not be encouraged.

Easements

Easements and other interests reserved by the grantors of real property to EBRPD for establishing Shadow Cliffs Recreation Area and the adjoining trail are discussed above. The easements discussed in this section are those which EBRPD conveyed subsequent to its acquisition of the Shadow Cliffs real estate.

In 1976 the EBRPD, pursuant to a series of instruments, conveyed ROWs and easements to the County of Alameda for a 10-foot-width along the trail to construct a bicycle path and maintain the slope of the bank adjoining the trail. In 1981, the EBRPD also conveyed a ROW and easement to the County of Alameda to construct, operate, and maintain traffic signal components at the entrance to Shadow Cliffs Recreation Area on Stanley Boulevard.

The EBRPD exchanged ROWs and easements with Kaiser Industries pursuant to an August 16, 1984 agreement. The exchange substituted Kaiser's 1970 easement which permitted a water line alignment to cross the park and discharge into Arroyo Del Valle for an alternative alignment. The exchange was necessitated by development of the waterslide facilities, which required realignment of the original water line.

Other Legal Agreements

Lease Arrangements for the Waterslide. The waterslide facilities are operated under a concession agreement between EBRPD and Heritage Investments (East Bay Regional Park District, 1980a). The initial agreement was for a 20-year term with a 5-year right of renewal (East Bay Regional Park District, 1980b). The title to the land is retained by the District while the slide facilities themselves are considered personal property of the concessionaire (East Bay Regional Park District, 1980b).

Under the agreement, the District receives a portion of the facility's revenues (East Bay Regional Park District, 1980a).

Licenses. The EBRPD granted two licenses to the City of Pleasanton on September 9, 1986. These license agreements permit the city to construct, operate, and maintain a storm drain across Shadow Cliffs property for drainage purposes. The storm drain and associated outfall will carry storm drainage from residential developments south of the park into the Arroyo Del Valle.

Resource Issues

- o Can future license agreements be drafted to ensure slope protection incidental to residential development south of Shadow Cliffs?
- o Should the Lone Star property east of Shadow Cliffs Lake ultimately be acquired as part of the recreation area as proposed in the Alameda County Specific Plan for reclamation?

Zoning and Other Agency Designations

Shadow Cliffs Regional Recreation Area is within an unincorporated area of Alameda County. The park is bordered by both Alameda County to the east and the City of Pleasanton to the north, south, and west. The land uses surrounding Shadow Cliffs reflect gravel mining, residential, and some agricultural uses. The following discussion presents a description of present land use designations and actual uses.

Land Use Designations

Alameda County. General plan designations for the portions of Alameda County which surround the park are presented in Figure 4-7. Immediately north of Stanley Boulevard the General Plan designations are primarily Industrial or Agriculture. The area immediately northwest of the park is Industrial above and Major Commercial below Stanley Boulevard. The area to the east of the park is entirely Industrial or Agriculture. South of the park, county General Plan designations are Industrial or Agriculture; Agriculture; Rural Residential; and Suburban Residential. The area west of the park is designated Major Commercial. (Alameda County Planning Department, 1977).

Alameda County is presently revising its General Plan. Designated uses are expected to more closely conform to the present land uses. Sand & Gravel Harvesting is the proposed designation to the north and east of the park. In the southeast, a small area of General and Limited Industrial is proposed. Residential designations ranging from Rural to High Density would occur to the south. The western edge would be designated Commercial and Offices, with the county pocket area immediately north of the park below Stanley Boulevard being designated Community Facilities. (Alameda County Planning Department, 1986).

Zoning designations are provided in Figure 4-8. The unincorporated areas north of Stanley Boulevard and east of the park are zoned Agricultural Districts (A) allowing nonurban uses with a 100-acre minimum building site. Unincorporated areas southeast of the park are zoned A. Other designations for unincorporated areas south of the park are: Single-Family Residential with a 100,000-square-foot minimum building site (R-1-B-E); limited agricultural use with a 5-acre minimum building site (L-B-E); and Planned Development District (P-D).

City of Pleasanton. General plan designations for the portions of Pleasanton adjacent to the park are shown in Figure 4-6. The area to the northwest is designated General and Limited Industrial. The remainder of the northern area within the city's jurisdiction is designated Sand and Gravel Harvesting. The southern area contains both Medium Density and High Density Residential designations. To the west, the land is designated

for Commercial and Office uses. (City of Pleasanton Planning Department, 1985).

Zoning designations (Figure 4-8) within the city limits to the north are Industrial (I-G). Designations within the city's boundaries south of the park from east to west are: Planned Unit Development (PUD) for medium density residential use; Residential Multiple (RM) requiring 4,000 sf per unit; and Freeway Commercial (CF). The area directly west of the park, below Stanley Boulevard, is zoned Agricultural (A). (City of Pleasanton Planning Department, 1984).

Adjacent Land Uses

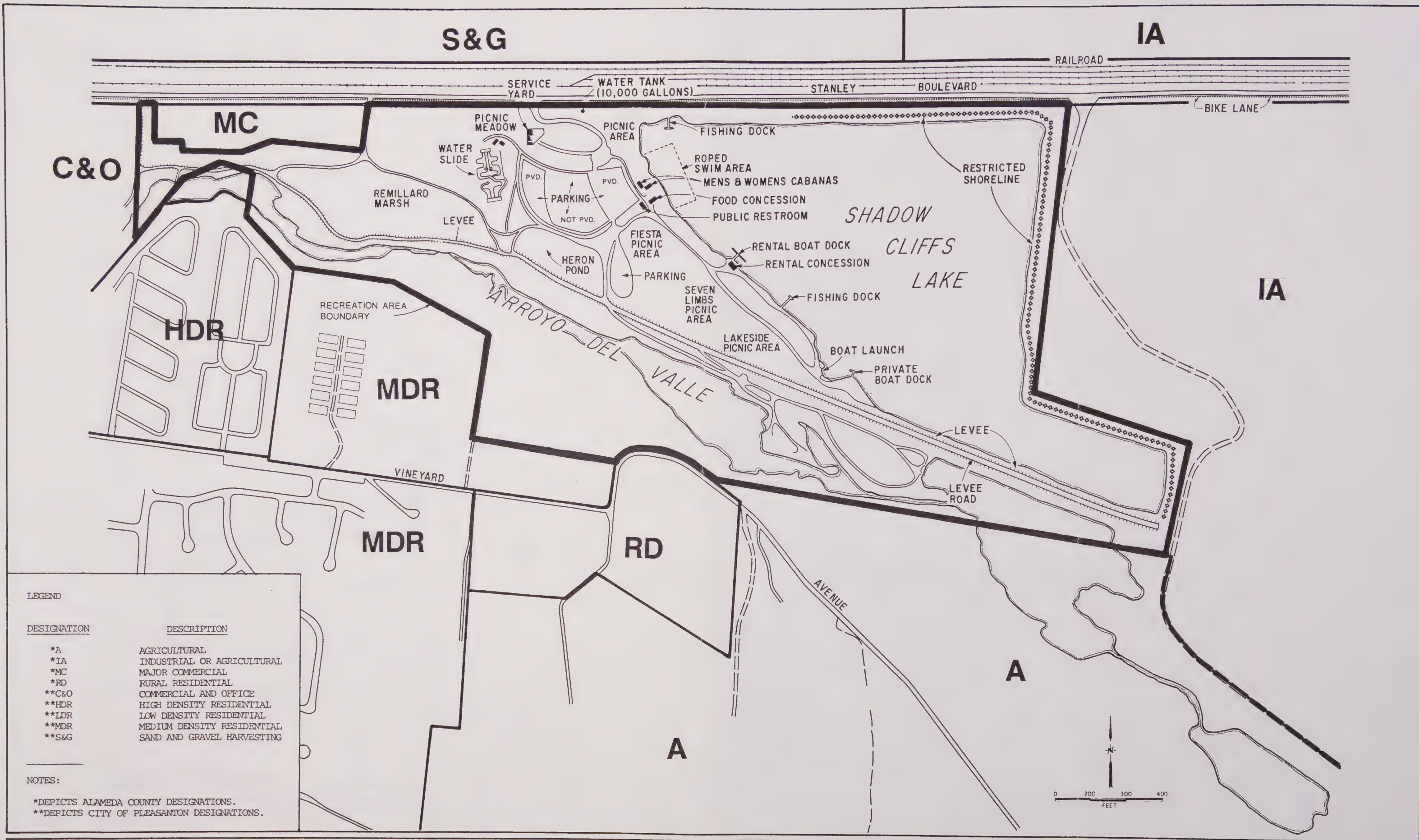
Stanley Boulevard forms the approximate northern land use border (Figure 4-9). Stanley Boulevard contains a bicycle trail. Railroad tracks parallel the northern edge of Stanley Boulevard. Active gravel mining operations occur north of Stanley Boulevard. Uses typically associated with these operations include quarry pits, soil stockpiling areas, and reservoirs. The mining uses are expected to occur for the next 10 to 50 years.

East of the park, the adjoining land use is also an active gravel mine (Figure 4-9).

South of the park, the predominant land uses are agricultural and residential (Figure 4-8). A portion of the southeast area is also part of the Lone Star Industries mining operation which occurs to the east. Agriculture, including vineyards and some fallow land, occurs in the unincorporated county area south of the park. The land use within Pleasanton north of Vineyard Avenue is residential. The southwest area presently contains two mobile home parks with approximately 400 total units. Between the mobile home parks and the city boundary is a new residential development undergoing construction. Shadow Cliffs Village will contain 200 single-family homes on approximately 35 acres when completed.

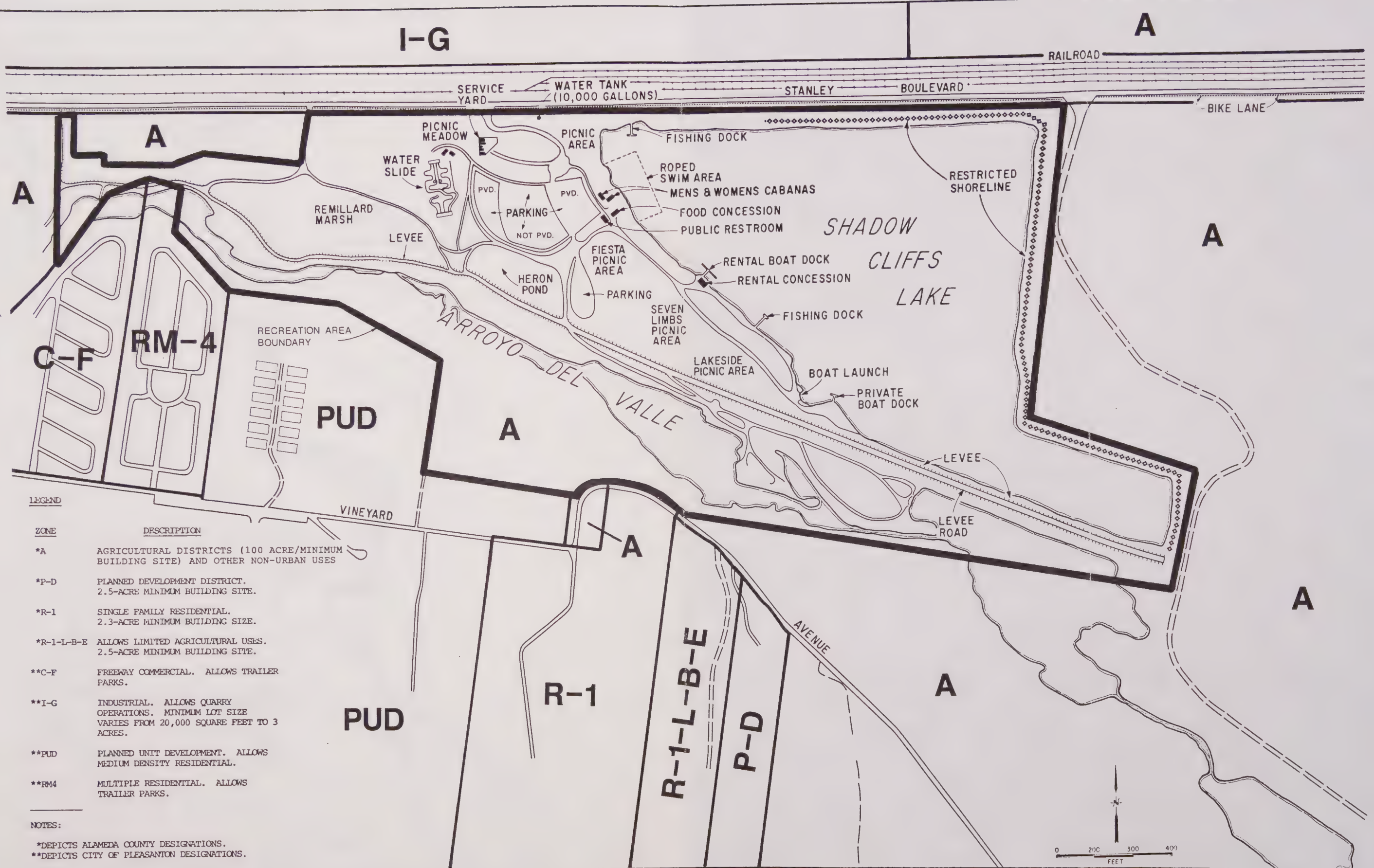
West of the park is vacant land within the city boundary (Figure 4-9). A vacant parcel of county-owned land also occurs immediately north of the park at its western edge.

Long-term trends for land use surrounding Shadow Cliffs are for additional recreation and residential uses to the north and east as part of the "chain of lakes" concept. Continued urban residential development appears likely south of the park. Commercial and other urban uses will occur to the west.



GENERAL PLAN DESIGNATIONS

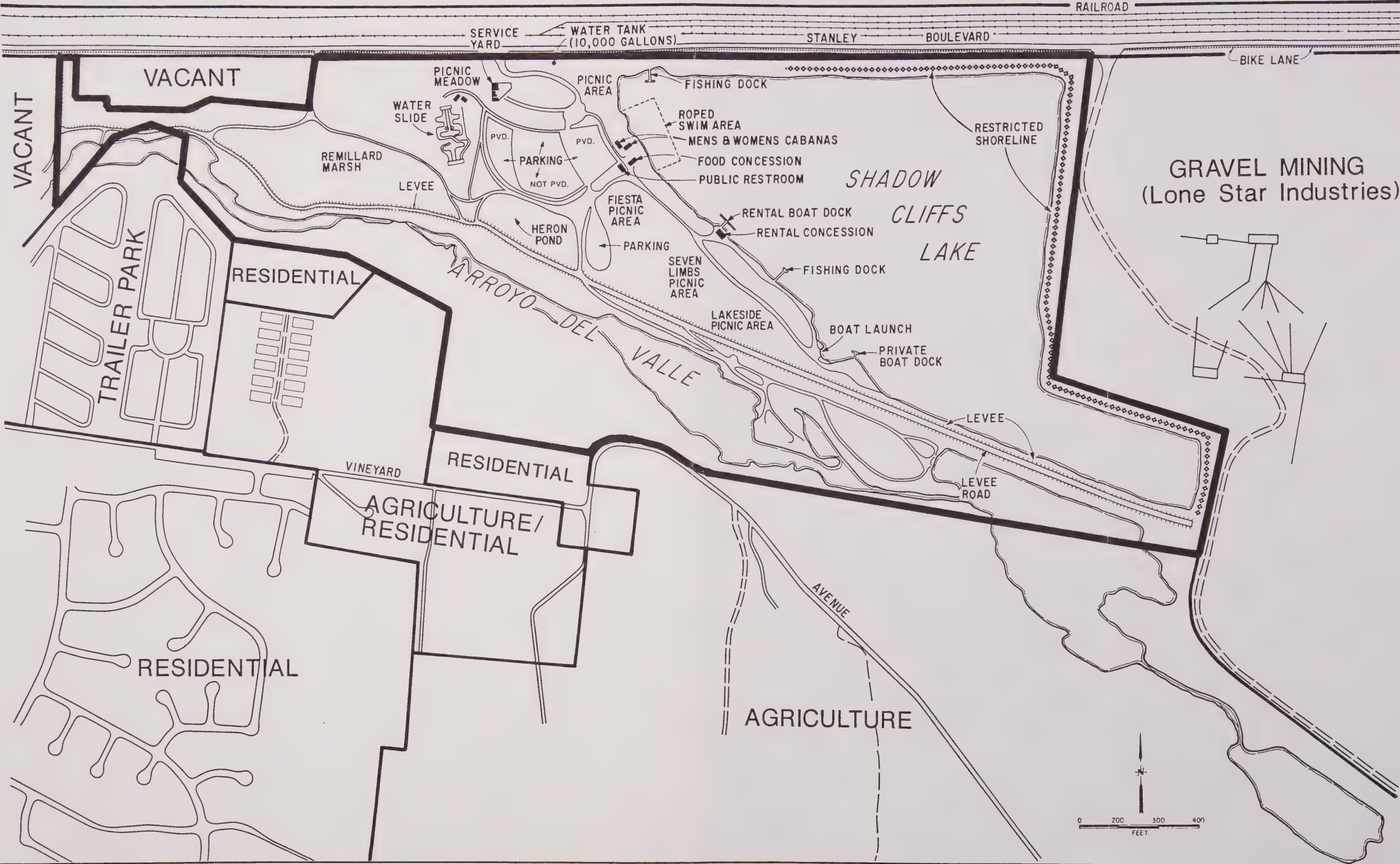
FIGURE 4-7.



ZONING DESIGNATIONS

FIGURE 4-8.

GRAVEL MINING (Kaiser Industries)



EXISTING LAND USE

FIGURE 4-9.

Source: Jones & Stokes Associates 1987

Resource Issues

- o What impact will the adjacent county parcel have on the parkland if it is developed as a service center?

Summary and Conclusions

Chapter 5

SUMMARY AND CONCLUSIONS

Shadow Cliffs is one of the more intensively used parklands within the EBRPD system. The parkland offers both land and water-related recreational opportunities including swimming, boating, fishing, picnicking, hiking, bicycling, birdwatching and nature study. Shadow Cliffs Lake provides the focus for many of these activities. The parkland contains the only waterslide facility operated on EBRPD lands.

Although Shadow Cliffs has been greatly shaped by past quarry operations, it still retains some important natural features. The Arroyo Del Valle bisects the parkland, providing wildlife habitat and recreational opportunities. The arroyo also serves an important flood control function. Seasonal marshes contained within the parkland provide additional wildlife habitat.

Issues facing this parkland which will be addressed in the land use planning process include the geologic stability of quarry slopes, lake water quality, facility retention and/or expansion, and the potential effects of adjacent land use on parkland use.

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Chapter 6

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Report Preparation

Chapter 7

REPORT PREPARATION

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Appendices

Appendix A

LIST OF PLANTS

Vascular plants identified during the February 17, 1987 field survey and additional species reported from Shadow Cliffs by Walter Knight (pers. comm.).

FERNS AND HORSETAILS	<u>Scientific Name</u>	<u>Occurrence</u> ^a
Salviniaceae (water fern family)		
mosquito fern	<u>Azolla filiculoides</u>	O
CONIFERS		
Pinaceae (pine family)		
digger pine	<u>Pinus sabiniana</u>	R
MONOCOTS		
Alismataceae (water-plantain family)		
machaerocarpus	<u>Machaerocarpus californicus</u>	
Cyperaceae (sedge family)		
sedge	<u>Carex spp.</u>	C
umbrella sedge	<u>Cyperus eragrostis</u>	C
umbrella sedge	<u>Cyperus</u>	
umbrella sedge	<u>Cyperus erythrorhizos</u>	R
bulrush	<u>Scirpus acutus</u>	C
California bulrush	<u>Scirpus californicus</u>	C
robust bulrush	<u>Scirpus robustus</u>	C
Liliaceae (lily family)		
soaproot	<u>Chlorogalum pomeridianum</u>	O
Poaceae (grass family)		
giant reed	<u>Arundo donax</u>	R
wild oat grass	<u>Avena barbata</u>	C
soft chess	<u>Bromus mollis</u>	C
rip gut brome	<u>Bromus rigidus</u>	C
pampas grass	<u>Cortaderia selloana</u>	R
bermuda grass	<u>Cynodon dactylon</u>	C
rye grass	<u>Elymus glaucus</u>	R
foxtail barley	<u>Hordeum leporinum</u>	C

Italian ryegrass	<u>Lolium multiflorum</u>	C
Harding grass	<u>Phalaris tuberosa</u> var. <u>stenoptera</u>	O
annual bluegrass	<u>Poa annua</u>	C
rabbitfoot grass	<u>Polypogon monspeliensis</u>	O
needlegrass	<u>Stipa</u> sp.	R
Juncaceae (rush family)		
Pacific rush	<u>Juncus effusus</u> var. <u>pacificus</u>	O
Typhaceae (cattail family)		
narrow-leaved cattail	<u>Typha angustifolia</u>	C
soft-flag cattail	<u>Typha domingensis</u>	
broad-leaved cattail	<u>Typha latifolia</u>	C
DICOTS		
Aceraceae		
red maple	<u>Acer rubrum</u>	O
silver maple	<u>Acer saccharinum</u>	O
Anacardiaceae (sumac family)		
poison oak	<u>Toxicodendron diversilobum</u>	C
Apicaceae (carrot family)		
poison-hemlock	<u>Conium maculatum</u>	O
sweet fennel	<u>Foeniculum vulgare</u>	C
sanicle	<u>Sanicula crassicaulis</u>	O
Araliaceae		
ivy	<u>Hedra helix</u>	O
Asteraceae (sunflower family)		
yarrow	<u>Achillea lanulosa</u>	O
annual aster	<u>Aster exilis</u>	
biennial sagebrush	<u>Artemisia biennis</u>	
coast sagebrush	<u>Artemisia californica</u>	
mugwort	<u>Artemisia douglasiana</u>	C
coyote brush	<u>Baccharis pilularis</u> var. <u>consanguinea</u>	C
mule fat	<u>Baccharis viminea</u>	C
Italian thistle	<u>Carduus pycnocephalus</u>	C
yellow-star thistle	<u>Centaurea solstitialis</u>	C
golden aster	<u>Chrysopsis (villosa or oregana)</u>	O
horseweed	<u>Conyza bonariensis</u>	C
horseweed	<u>Conyza canadensis</u>	C
woolly sunflower	<u>Eriophyllum confertiflorum</u>	
treasure flower	<u>Gazonia "orange"</u>	

cudweed	<u>Gnaphalium</u> sp.	O
gunweed	<u>Grindelia camporum</u>	C
catsear	<u>Hypochoeris glabra</u>	C
pineapple weed	<u>Matricaria matricarioides</u>	C
African daisy	<u>Osteospermum fruticosum</u>	
groundsel	<u>Senecio vulgaris</u>	C
milk thistle	<u>Silybum marianum</u>	C
cocklebur	<u>Xanthium strumarium</u> var. <u>canadense</u>	C
Berberidaceae		
Nevin's mahonia	<u>Mahonia nevinii</u>	
Betulaceae (birch family)		
white alder	<u>Alnus rhombifolia</u>	O
Brassicaceae (mustard family)		
black mustard	<u>Brassica nigra</u>	C
wild radish	<u>Raphanus sativus</u>	C
tower mustard	<u>Sisymbrium officinale</u>	C
Caprifoliaceae (honeysuckle family)		
elderberry	<u>Sambucus</u> sp.	O
Ceratophyllaceae		
hornwort	<u>Ceratophyllum demersum</u>	
Chenopodiaceae (goosefoot family)		
red orache	<u>Atriplex rosea</u>	R
Dipsacaceae (teasel family)		
teasel	<u>Dipsacus sylvestris</u>	C
Ericaceae		
Texas madrone	<u>Arbutus texana</u>	R
Euphorbiaceae (spurge family)		
spurge	<u>Chamaesyce serpyllifolia</u>	O
Fabaceae (pea family)		
Sydney golden-wattle	<u>Acacia longifolia</u>	O
blackwood acacia	<u>Acacia melanoxylon</u>	O
honey locust	<u>Gleditsia triacanthos</u>	O
wild pea	<u>Lathyrus</u> sp.	C
valley sky lupine	<u>Lupinus nanus</u> var. <u>vallicola</u>	C

yellow clover	<u>Melilotus albus</u>	C
clover	<u>Trifolium spp.</u>	C
vetch	<u>Vicia villosa</u>	C
Fagaceae (oak family)		
coast live oak	<u>Quercus agrifolia</u>	O
blue oak	<u>Quercus douglasii</u>	R
valley oak	<u>Quercus lobata</u>	C
southern live oak	<u>Quercus virginianicus</u>	O
Geraniaceae (geranium family)		
red-stemmed filaree	<u>Erodium cicutarium</u>	C
big storksbill	<u>Erodium botrys</u>	C
broadleaved filaree	<u>Erodium moschatum</u>	C
soft geranium	<u>Geranium molle</u>	C
cut-leaved geranium	<u>Geranium dissectum</u>	C
Halogoraceae (water-milfoil family)		
water-milfoil	<u>Myriophyllum spicatum</u>	C
water-milfoil	<u>Myriophyllum spp.</u>	C
Hippocastanceae (buckeye family)		
buckeye	<u>Aesculus californicus</u>	O
Hydrophyllaceae (waterleaf family)		
yerba santa	<u>Eriodictyon californicum</u>	O
Hypericaceae (St. John's wort family)		
Klamath weed	<u>Hypericum perforatum</u>	O
Lamiaceae (mint family)		
horehound	<u>Marrubium vulgare</u>	C
pennyroyal	<u>Mentha pulegium</u>	O
Lauraceae (laurel family)		
California bay	<u>Umbellularia californica</u>	O
Loasaceae (loasa family)		
blazing stars	<u>Mentzelia lindleyi</u>	
Magnoliaceae (magnolia family)		
bull-bay	<u>Magnolia grandiflora</u>	O
Moraceae (mulberry family)		

fruitless mulberry	<u>Morus sriblingi</u>	O
Platanaceae (planetree family)		
London planetree	<u>Platanus acerifolia</u>	O
Malvaceae (mallow family)		
cheese weed	<u>Malva parviflora</u>	
Myrtaceae (myrtle family)		
blue gum	<u>Eucalyptus</u> sp.	
Onagraceae (evening primrose family)		
clarkia	<u>Clarkia</u> sp.*	
willow herb	<u>Epilobium</u> sp.* (<u>adenocaulon</u> ?)	
willow herb	<u>Epilobium paniculatum</u>	
Papaveraceae (poppy family)		
California poppy	<u>Eschscholzia californica</u>	
Plantaginaceae (plantain family)		
selfheal	<u>Plantago lanceolata</u>	
common plantain	<u>Plantago major</u>	
Plantanaceae (planetree family)		
western sycamore	<u>Plantanus racemosa</u>	
Polygonaceae (buckwheat family)		
knotweed	<u>Polygonum aviculare</u>	C
curly dock	<u>Rumex crispus</u>	C
western dock	<u>Rumex occidentalis</u>	C
fiddle dock	<u>Rumex pulcher</u>	C
Portulacaceae (purslane family)		
miner's lettuce	<u>Claytonia perfoliata</u>	O
Rosaceae (rose family)		
almond	<u>Prunus amygdalus</u>	R
evergreen pear	<u>Pyrus kawakanii</u>	O
Himalaya berry	<u>Rubus procerus</u>	C
Rubiaceae (bedstraw family)		
bedstraw	<u>Galium murale</u>	C

Salicaceae (willow family)

Fremont cottonwood	<u>Populus fremontii</u>	C
Goodding's willow	<u>Salix gooddingii</u>	C
sandbar willow	<u>Salix hindsiana</u>	C
arroyo willow	<u>Salix lasiolepis</u>	C
willow	<u>Salix sp.</u>	
weeping willow	<u>Salix babylonia</u>	O

Saxifragaceae (saxifrage family)

evergreen currant	<u>Ribes viburnifolium</u>	O
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Scrophulariaceae (figwort family)

kickxia	<u>Kickxia spuria</u>	
common mullein	<u>Verbascum thaspus</u>	C
moth mullein	<u>Verbascum blatteria</u>	C
hebe	<u>Veronica speciosa</u>	O

Ulmaceae (elm family)

saw leaf zelkova	<u>Zelcova serrata</u>	O
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Vitaceae (grape family)

California grape	<u>Vitis californicus</u>	O
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Non-Vascular Plants

BLUEGREEN ALGAE

Nostocaceae

<u>Aphanizomenon sp.</u>	R
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Osillatoraceae

<u>Lyngbia sp.</u>	R
<u>Oscillatoria sp.</u>	R

GREEN ALGAE

Chroococcaceae

<u>Microcystis sp.</u>	R
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Coscinodiscaceae

<u>Melosiva sp.</u>	R
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Pesmidiaceae

	<u>Staurastum</u> sp.	C
Hydroicthyaceae		
	<u>Pediastrum</u> sp.	R
Palmellaceae		
	<u>Gleocystis</u> sp.	R
Tribonemataceae		
	<u>Tribonema</u> sp.	C
Zygnemataceae		
	<u>Mougeotia</u> sp.	C
	<u>Spirogyra</u> sp.	R
DIATOMS		
Fragilariaceae		
	<u>Asterionella</u> sp.	C
	<u>Fragellaria</u> sp.	R
Tabellariaceae		
	<u>Tabellaria</u> sp.	R

^aC = Common
O = Occasional
R = Rare

Appendix B

LIST OF WILDLIFE SPECIES

The following list was derived from a site visit to the Shadow Cliffs Regional Recreational Area, Alameda County on February 17, 1987, and consultation with agency personnel and local experts. Habitats present include oak woodland-grassland (O), riparian woodland (R), freshwater marsh (M), disturbed upland (U), open water-aquatic (W), aerial (A), and urban or developed areas (D). Abundance criteria include common (C), occasional (O), and rare (R). Occurrence categories include resident (including breeding) (R), migratory (M), and vagrant (V).

Common Name	Scientific Name	Habi- tat	Abun- dance	Occur- rence
<u>Amphibians</u>				
Bufonidae (true toads)				
western toad	<u>Bufo boreas</u>	MR	O	R
Hylidae (treefrogs and relatives)				
pacific treefrog	<u>Hyla regilla</u>	RM	O	R
Ranidae (true frogs)				
bullfrog	<u>Rana catesbeiana</u>	MR	O	R
Salmandridae (newts)				
California newt	<u>Taricha torosa</u>	RMU	O	R
<u>Reptiles</u>				
Colubridae (colubrids)				
gopher snake	<u>Pituophis melanoleucus</u>	OU	O	R
western terrestrial garter snake	<u>Thamnophis elegans</u>	OU	O	R
Iguanidae (iguanids)				
western fence lizard	<u>Sceloporus occidentalis</u>	UO	O	R

Common Name	Scientific Name	Habitat	Abundance	Occurrence
<u>Birds</u>				
Accipitridae (hawks, old world vultures, and harriers) red-tailed hawk	<u>Buteo jamaicensis</u>	ROA	O	R
Aegithalidae (bushtit) bushtit	<u>Psaltiriparus minimus</u>	OR	C	R
Alaudidae (larks) horned lark	<u>Eremophila alpestris</u>	U	O	M
Anatidae (swans, geese, and ducks) wood duck	<u>Aix sponsa</u>	MR	O	M
mallard	<u>Anas platyrhynchos</u>	MW	O	R
lesser scaup	<u>Aythya affinis</u>	W	O	M
canada goose	<u>Branta canadensis</u>	W	O	R
Apodidae (swifts) white-throated swift	<u>Aeronautes saxatalis</u>	A	O	M
Ardeidae (herons and bitterns) great blue heron	<u>Ardea herodias</u>	MR	O	R
green-backed heron	<u>Butorides striatus</u>	RM	O	R
Bombycillidae (waxwings) cedar waxwing	<u>Bombycilla cedrorum</u>	RO	C	M
Cathartidae (american vultures) turkey vulture	<u>Cathartes aura</u>	A	O	M
Charadriidae (plovers and relatives) killdeer	<u>Charadrius vociferus</u>	MU	C	R
Columbidae (pigeons and doves) rock dove	<u>Columba livia</u>	OAD	C	R
mourning dove	<u>Zenaida macroura</u>	ORAUD	C	R
Coracidae belted kingfisher	<u>Ceryle alcyon</u>	RMW	O	R
Corvidae (jays, magpies, and crows) scrub jay	<u>Aphelocoma coerulescens</u>	ORU	C	R
American crow	<u>Corvus brachyrhynchos</u>	RU	C	R

Common Name	Scientific Name	Habitat	Abundance	Occurrence
<u>Birds (Continued)</u>				
Emberizidae (wood warblers, sparrows, blackbirds, and relatives)				
red-winged blackbird	<u>Agelaius phoeniceus</u>	MR	C	R
yellow-rumped warbler	<u>Dendroica coronata</u>	RO	C	M
northern oriole	<u>Icterus galbula</u>	RO	O	M
dark-eyed junco	<u>Junco hyemalis</u>	RUO	C	R
song sparrow	<u>Melospiza melodia</u>	RM	C	R
Lincoln's sparrow	<u>Melospiza lincolnii</u>	RM	O	M
brown-headed cowbird	<u>Molothrus ater</u>	RD	C	R
luzuli bunting	<u>Passerina amoena</u>	ROU	O	M
black-headed grosbeak	<u>Pheucticus melanocephalus</u>	RO	O	M
rufous-sided towhee	<u>Pipilo erythrophthalmus</u>	RU	C	R
brown towhee	<u>Pipilo fuscus</u>	RU	C	R
western tanager	<u>Piranga ludoviciana</u>	RO	O	M
western meadowlark	<u>Sturnella neglecta</u>	U	C	R
orange-crowned warbler	<u>Vermivora celata</u>	ROU	O	M
wilson's warbler	<u>Wilsonia pusilla</u>	RO	O	M
golden-crowned sparrow	<u>Zonotrichia atricapilla</u>	RU	C	M
white-crowned sparrow	<u>Zonotrichia leucophrys</u>	RU	C	R
Falconidae (caracaras and falcons)				
american kestrel	<u>Falco sparverius</u>	ROAD	C	M
Fringillidae (finches)				
lesser goldfinch	<u>Carduelis psaltria</u>	ROU	C	R
American goldfinch	<u>Carduelis tristis</u>	R	C	R
house finch	<u>Carpodacus mexicanus</u>	ROD	C	R
Hirundinidae (swallows)				
cliff swallow	<u>Hirundo pyrrhonota</u>	A	C	M
barn swallow	<u>Hirundo rustica</u>	A	C	M
tree swallow	<u>Tachycineta bicolor</u>	AR	C	M
Laridae (gulls and terns)				
California gull	<u>Larus californicus</u>	WAD	C	M
ring-billed gull	<u>Larus delawarensis</u>	WAD	C	M
forster's tern	<u>Sterna forsteri</u>	WA	O	M
Minidae				
northern mockingbird	<u>Mimus polyglottos</u>	ROU	C	R
Muscicapidae (old world warblers, gnatcatchers, kinglets, thrushes, bluebirds, and wrentits)				
hermit thrush	<u>Catharus guttatus</u>	RU	O	M
ruby-crowned kinglet	<u>Regulus calendula</u>	RO	C	M
western bluebird	<u>Sialia mexicana</u>	ORU	O	R
American robin	<u>Turdus migratorius</u>	ROU	C	R

Common Name	Scientific Name	Habitat	Abundance	Occurrence
<u>Birds (Continued)</u>				
Passeridae (weaver finches) house sparrow	<u>Passer domesticus</u>	D	C	R
Phalacrocoracidae (cormorants) double-crested cormorant	<u>Phalacrocorax auritus</u>	WR	O	R
Phasianidae (quails, pheasants, and relatives) California quail	<u>Callipepla californica</u>	ROU	C	R
Picidae (woodpeckers and wrynecks) northern flicker acorn woodpecker nuttall's woodpecker downy woodpecker	<u>Colaptes auratus</u> <u>Melanerpes formicivorus</u> <u>Picoides nuttallii</u> <u>Picoides pubescens</u>	ROU OR OR RO	C O O O	R R R R
Podicipedidae (grebes) eared grebe pied-billed grebe	<u>Podiceps nigricollis</u> <u>Podilymbus podiceps</u>	W W	O O	M R
Rallidae (Cranes, Rails, and Relatives) American coot	<u>Fulica americana</u>	WM	C	R
Sittidae (nuthatches) white-breasted nuthatch	<u>Sitta carolinensis</u>	OR	O	R
Sturnidae (starlings) european starling	<u>Sturnus vulgaris</u>	RUOAD	C	R
Trochilidae (hummingbirds) Anna's hummingbird	<u>Calypte anna</u>	ROA	O	R
Troglodytidae (wrens) Bewick's wren	<u>Thryomanes bewickii</u>	RO	C	R
Tyrannidae (tyrant flycatchers) olive-sided flycatcher western wood-pewee western flycatcher ash-throated flycatcher black phoebe western kingbird	<u>Contopus borealis</u> <u>Contopus sordidulus</u> <u>Empidonax difficilis</u> <u>Myiarchus cinerascens</u> <u>Sayornis nigricans</u> <u>Tyrannus verticalis</u>	RO RO R RO RM ROU	O O O O C C	M M M M R M
Vireonidae (typical vireos) warbling vireo	<u>Vireo gilvus</u>	RO	O	M

Common Name	Scientific Name	Habitat	Abundance	Occurrence
<u>Mammals</u>				
Cervidae (deer, elk, and relatives)				
mule deer	<u>Odocoileus hemionus</u>	ROU	O	R
Cricetidae (deer mice, voles, and relatives)				
deer mouse	<u>Peromyscus maniculatus</u>	UR	C	R
muskrat	<u>Ondatra zibethicus</u>	M	O	R
Didelphidae (opossum)				
virginia opossum	<u>Didelphis virginiana</u>	R	O	R
Geomyidae (pocket gophers)				
Botta's pocket gopher	<u>Thomomys bottae</u>	UR	C	R
Leporidae (rabbits and hares)				
black-tailed hare	<u>Lepus californicus</u>	UOR	C	R
desert cottontail	<u>Sylvilagus audubonii</u>	UR	O	R
Mustelidae (weasels, badgers, and relatives)				
striped skunk	<u>Mephitis mephitis</u>	R	O	R
long-tailed weasel	<u>Mustela frenata</u>	RO	O	R
Sciuridae (squirrels, chipmunks, and marmots)				
fox squirrel	<u>Sciurus niger</u>	R	C	R
California ground squirrel	<u>Spermophilus beecheyi</u>	U	C	R

Appendix C

LIST OF FISH AND AQUATIC INVERTEBRATES

Common and Scientific Names of Fish, by Family, Present in Shadow Cliffs Lake and Arroyo Del Valle

	<u>Scientific Name</u>	<u>Occurrence</u> ^a
Atherinidae		
Mississippi silverside	<u>Menidia audens</u>	Both
Catostomidae		
Sacramento sucker	<u>Catostomus occidentalis</u>	Both
Centrarchidae		
Bluegill	<u>Lepomis macrochirus</u>	Both
green sunfish	<u>Lepomis cyanellus</u>	Lake
largemouth bass	<u>Micropterus salmoides</u>	Both
redeer sunfish	<u>Lepomis microlophus</u>	Lake
smallmouth bass	<u>Micropterus dolomieu</u>	Lake
Cyprinidae		
carp	<u>Cyprinus carpio</u>	Both
goldfish	<u>Carassius auratus</u>	Arroyo
hitch	<u>Lavinia exilicauda</u>	Arroyo
Sacramento blackfish	<u>Orthodon microlepidotus</u>	Arroyo
Sacramento squawfish	<u>Ptychocheilus grandis</u>	Arroyo
Ictaluridae		
channel catfish	<u>Ictalurus punctatus</u>	Lake
white catfish	<u>Ictalurus catus</u>	Both
Poeciliidae		
mosquitofish	<u>Gambusia affinis</u>	Lake
Salmonidae		
rainbow trout	<u>Salmo gairdneri</u>	Lake

Aquatic Invertebrates

	<u>Scientific Name</u>	<u>Occurrence</u> ^b
Actinophrydae (Protozoan)		
	<u>Actinophrys</u> sp.	R
Ochromonadidae (Protozoan)		
	<u>Dinobryon</u> sp.	R
Peridiniidae (Protozoan)		
	<u>Ceratium</u> sp.	C
Bosminae (Copepod)		
	<u>Bosmina</u> sp.	R
Cyclopidae (Copepod)		
	<u>Cyclops</u> sp.	C
Diaptomidae (Copepod)		
	<u>Diaptomus</u> sp.	C
Daphnidane (Water flea)		
	<u>Daphnia</u>	C
Brachionidae (Rotifer)		
	<u>Keratella</u> sp.	C
Synchaetidae (Rotifer)		
	<u>Polyanthna</u> sp.	C
Larva		
	Copepodite (Copepod larva)	C
	Nauplius (Crustacean larva)	C

Source: California Department of Fish and Game, 1979, 1981, 1984.

^a Lake: Shadow Cliffs Lake.
 Arroyo: Arroyo Del Valle.
 Both: Both of the above.

^b C: Common
 O: Occasional
 R: Rare

APPENDIX D

SPECIAL STATUS WILDLIFE SPECIES SHADOW CLIFFS REGIONAL RECREATION AREA ALAMEDA COUNTY

Species	Legal Status ^a	Status at Shadow Cliffs
<u>Legally Protected Species</u>		
California tiger salamander	C2	Occurs within 1 mile of the site.
Bald eagle	FE, CE	Up to 12 birds have been reported roosting at the nearby San Antonio Reservoir, but no definite records.
<u>Other Special Interest Species</u>		
Common loon	none ^b	Possible occurrence in winter.
Double-crested cormorant	none ^b	Large numbers roost and feed at the site.
Northern harrier	none ^b	Possible occurrence.
Osprey	none ^b	Possible occurrence.
Sharp-shinned hawk	none ^b	Definite occurrence.
Cooper's hawk	none ^b	Definite occurrence.
Golden eagle	none ^b	Probable occurrence.
Yellow warbler	none ^b	Probable occurrence.

^a Federal = U. S. Fish and Wildlife Service (1985).

FE = Listed as "Endangered" under the federal Endangered Species Act.

C2 = A "Candidate" species under review for federal listing. "Category 2" includes species for which the U. S. Fish and Wildlife Service presently has some information indicating that "Proposing to list them as endangered or threatened species is possibly appropriate," but for which further biological research and field study are usually needed to determine biological vulnerability and threats.

State = California Department of Fish and Game (1983).

CE = Listed as "Endangered" under the State Endangered Species Act.

^b These species have no formal legal protection but they are listed as "bird species of special concern" by the California Department of Fish and Game. Species included on this list are those whose breeding populations have severely declined in the state, so that extirpation is a real possibility (Remsen 1978).

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